AGRICULTURAL RESEARCH INSTITUTE

PUSA

PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY

OF LONDON.

PART VI.

1838.

PRINTED FOR THE SOCIETY,

BY R. AND J. E. TAYLOR, RED LION COURT, FLEET STREET.

LIST

OF

CONTRIBUTORS,

With References to the several Articles contributed by each.

BACHMAN, Dr. *page*

Monograph of the Species of Squirrel inhabiting North America 85

BIBRON, M.

Observations on some British Specimens of the Genus Triton 23

BICHENO, J. E., Esq.

Letter accompanying the Donation of a Skin of the Burrhal Sheep from the Himalaya Mountains 79

BLYTH, E., Esq.

Observations on the Structure of the Feet of the *Trogonidæ* 20

Remarks on the Plumage and Progressive Changes of the Crossbill and Linnet 115

Exhibition of the Skull of a Cumberland Ox, presenting a remarkable Development of the Horns 120

CAMPBELL, Colonel P.

Letter respecting the probability of procuring some White Elephants for the Menagerie 119

CANTOR, Dr. T.

Notice of the *Hamadryas*, a Genus of Hooded Serpents with Poisonous Fangs and Maxillary Teeth 72

Observations on Marine Serpents 80

CUMING, H., Esq.

On the Habits of some species of Mammalia from the Philippine Islands 67

DESJARDINS, M. J.

Letter from 119

DOHERTY, Lieut.-Colonel. *page*
Letter relating to the Chimpanzee and Hippopotamus. . 119

GORDON, A., Esq.
Letter begging the Society's acceptance of two Australian Quadrupeds which have been described in the Society's Proceedings 149

GOULD, Mr. J.
On two New Species of Birds from Australia, belonging to the Genus *Ptilotis* 24

GRAY, J. E., Esq.
On a New Species of Perameles 1

HARRIS, Capt. W. C.
On a New Species of Antelope 1

HARVEY, J. B., Esq.
Exhibition of some Specimens belonging to the Genera *Siphunculus* and *Asterias*, and notice of the occurrence of the Red-band Fish (*Cepola rubescens*) near Teignmouth . . 45
Vote of Thanks to, ... 76

HOPE, the Rev. F. W.
Observations on the Ravages of the *Limnoria terebrans*. . 66

HORSFIELD, Dr.
Exhibition of Mr. M'Clelland's Collection of Indian Mammalia and Birds 157, 167

MARTIN, W., Esq.
On a New Genus of Insectivorous Mammalia 17
On the Visceral Anatomy of the Spotted Cavy (*Cœlogenys subniger*, Cuv.) 54
On some Species of Chameleon from Fernando Po . . 63
On two Specimens of Saurian Reptiles sent to the Society by Mr. Cuming 68
On two New Species of Snakes 83
On some Snakes collected during the Euphrates Expedition 81
Observations on the Sooty and White-eyelid Monkeys (*Cercopithecus fuliginosus* and *C. Æthiops.*) 117

MICHELLOTTI, Dr.
Letter from, requesting the Society's acceptance of a Collection of Fossil Shells from Italy 167

OGILBY, W., Esq.
On a Collection of Mammalia procured by Captain Alexander during his journey into the country of the Damaras, on the south-west coast of Africa 5
On a New Species of Galago 6

OGILBY, W., Esq. page
On a New Species of Kangaroo 23
On a New Species of Marsupial Animal found by Major Mitchell on the banks of the River Murray in New South Wales 25
Description of various species of the Genus *Hypsiprymnus* 62
Remarks upon the Burrhal Sheep 79
On a New Species of Muntjac Deer from China . . . 105

OTLEY, Mr.
Extract of a letter from, relating to the *ligamentum teres* in the Coypou 118

OWEN, Professor.
Notes on the Anatomy of the Nubian Giraffe . . . 6, 20
Observations on the Genus *Menopoma* 15
On the Anatomy of the Dugong 28
Description of the Organs of Deglutition in the Giraffe . 47
On the Anatomy of the Apteryx (*Apteryx Australis*, Shaw.) 48, 71, 105
On the Osteology of the Marsupialia 120
On the Dentition of the Koala (*Lipurus cinereus*, Goldf.) 154

PATON, W., Esq.
Letter accompanying a Donation to the Museum . . . 81

POEY, Dr. P.
Letter relating to Two Specimens of *Capromys Fournieri*, presented by him to the Society 167

PORTER, Mr.
Exhibition of a Specimen of the *Gymnotus electricus* . . 110

ROBERTSON, Capt. C.
Letter containing an account of the capture of a Peregrine Falcon on board the ship Exmouth, on her passage from Bengal to London 77

SMITH, Lieut. T.
Extract from his Journal relating to the Burrhal Sheep . . 79

STRACHAN, F., Esq.
Letter referring to the Chimpanzee and Hippopotamus . 66

SYKES, Lieut.-Col.
Observations on the *Canis jubatus* and some Skins of the *Felis Pardina* 111
On the Calandra Lark 113
On the Fishes of the Deccan 157

V. DER HOEVEN, M.
On a large Species of Salamander from Japan 25

WATERHOUSE, G. R., Esq. *page*
On a New Species of Squirrel 19
On a New Species of the Genus *Delphinus* 23
On two New Species of Mammalia, from the Society's Collection, belonging to the Genera *Gerbillus* and *Herpestes* 55
On some New Species of Mammalia from Fernando Po . 57
On some Skins of two species of Monkeys from Sierra Leone 61
On a New Species of Hare from North America . . . 103
On the Flying Lemurs (*Galeopithecus*) 119
On the Dentition of the Flying Opossums 149
On the Skull and Dentition of the American Badger (*Meles Labradoria*) 153

WATTS, G. B., Esq.
Letter relating to a Collection of Specimens intended for the Society's Museum 149

WILLIAMS, W., Lieut. R.A.
Account of a Wasp's Nest presented to the Society by the Governor of Ceylon 167

YARRELL, W., Esq.
On a New Species of Swan 19
On the occurrence of the Anchovy in the Thames . . . 66

ERRATUM.

P. 112. bottom line, after the word Australia, *add* and the Islands of the Indian Archipelago.

PROCEEDINGS

OF THE

ZOOLOGICAL SOCIETY OF LONDON.

January 9th, 1838.

Thomas Bell, Esq., in the Chair.

Mr. Gray exhibited a new species of *Perameles*, in size and general appearance very closely agreeing with *Per. nasutus*, but peculiar for its very short white tail, and in having several indistinct broad white bands over the haunches. The species inhabits Van Diemen's Land, where it frequents gardens, and commits great havoc amongst bulbous roots, which it is said to devour with avidity. Mr. Gray proposed for it the name of *Per. Gunnii*, after its discoverer, Mr. Ronald Gunn*.

It was suggested in the course of some discussion which followed Mr. Gray's observations, that the roots upon which this species was supposed to feed, were probably attacked for the purpose of procuring such insects as might be found in them; and Mr. Owen in reference to this point alluded to a dissection of a *Perameles* made by Dr. Grant, and published in the Wernerian Transactions, in which insects were found to constitute almost the sole contents of the stomach and intestines.

A very large and beautiful Antelope, of a species hitherto entirely unknown, and which had just arrived in England under the care of Captain Alexander from the Cape, was in the room for exhibition; and the history of the circumstances under which it had been discovered, were detailed in the following letter, addressed to the Secretary, by Capt. W. C. Harris, of the Bombay Engineers.

Cape Town, South Africa, Oct. 10, 1837.

Sir,—I beg the favour of your presenting to the Zoological Society the accompanying drawing and description of an entirely new and very interesting species of Antelope, which I discovered in the course of an expedition to the interior of Africa, from which I have lately returned. A perfect specimen that I brought down has been admirably set up by Monsieur Verreaux, the French naturalist at Cape Town, and will be sent to London in the course of a few days, to the care of Dr. Andrew Smith. It would appear to belong to the sub-genus *Aigocerus*, and in form, as well as in other respects, bears remote resemblance to the *Aigocerus Equina*, (Roan Antelope or Bastard Gemsbok,) with which it has been confounded by many

* Since described in the Annals of Zoology and Botany, for April, 1838.

persons imperfectly acquainted with the subject to whom it has been exhibited. A comparison of the two animals will, however, render the existing difference between them too obvious to demand any observation from me.

During nearly three months that I hunted over the country lying between the 24th and 26th parallels of south latitude, within 28° and 30° east longitude, I only once met with the Antelope in question. On the northern side of the Cashan range of mountains, about a degree and a half south of the tropic of Capricorn, I found a herd, consisting of nine does and two bucks, and followed them until I captured the specimen from which the enclosed drawing was made.

None of the natives of the country were familiar with the appearance of the animal when first interrogated on the subject, although after conferring amongst themselves, they agreed that it was Kōō-käme, (*Oryx Capensis,*) the Gemsbok; and, of the many individuals to whom it has been shown, a trader named Robert Scoon is the only one by whom it has been recognized. He declares that he saw a herd of them some years ago near the very spot I have described, but could not succeed in killing one. It is, doubtless, very rare; and, judging from the formation of the foot, entirely confined to the mountains.

The females are somewhat smaller than the males, are provided with shorter and slighter, but similarly shaped horns, and are similarly marked; a deep chestnut brown, verging upon black, taking the place of the glossy black coat of the male. I did not obtain a female specimen; but whilst riding down the buck, I had abundant opportunities of narrowly observing them within the distance of a few yards, and am, therefore, positive as to the correctness of the description here given.

I have for the present designated the new Antelope "*Aigocerus niger*;" but of course it will rest with the Zoological Society either to confirm that name, or to bestow one more appropriate or more scientific; and I shall be gratified by their doing so.

I have the honour to be, sir,

Your most obedient servant,

W. C. Harris.

The following description of this interesting addition to the *Fauna* of Southern Africa was appended to the above letter.

Aigocerus niger. The Sable Antelope.

Adult male four feet six inches high at the shoulder; nearly nine feet in extreme length. Horns thirty-seven inches over the curve, placed immediately above the eyes, rather higher than occurs in the *Aigocerus Equina*; flat, slender, sub-erect, and then strongly bent back similar wise; at first gradually diverging, and then running parallel to each other; three-fourths annulated with about thirty strongly pronounced, incomplete rings, more rigid on the edges, but chiefly broken on the outside of the horn; the remaining one fourth smooth, round, slender and pointed. Head somewhat attenuated

towards the muzzle, and compressed laterally. Carcase robust. Withers elevated. Neck broad and flat. Hoofs black, obtuse, and rather short. Hair close and smooth: general colour of the coat intense glossy black, with an occasional cast of deep chestnut. A dirty white streak commencing above each eye, continued by a pencil of long hairs covering the place of the suborbital pouch, (of which cavity no trace is to be found in this Antelope,) and then running down the side of the nose to the muzzle, which is entirely white; the same colour pervading one half of the cheek, the chin and the throat. Ears ten inches long, narrow, tapering and pointed; white within, lively chestnut without, with black pencilled tips. A broad half crescent of deep chestnut at the base of each ear, behind. A small, entire black muzzle. A copious standing black mane, five and a half inches high, somewhat inclined forwards, and extending from between the ears to the middle of the back. Hair of the throat and neck longer than that of the body. Belly, buttocks, and inside of thighs, pure white. A longitudinal dusky white stripe behind each arm. Fore legs jet black inside and out, with a tinge of chestnut on and below the knees. Hind legs black, with a lively chestnut patch on and below the hocks. Tail black; long hair skirting the posterior edge, and terminating in a tuft which extends below the hocks. Sheath tipped with black.

Female smaller than the male, with smaller, but similarly shaped horns. Colour, deep chestnut brown verging upon black.

Very rare. Gregarious, in small families. Inhabits the great mountain range which threads the more eastern parts of Moselekatse's territory.

DIMENSIONS.

Height at shoulder	54 inches.
Length of body	44
Length of neck	17
Length of head	19
Length of tail	25
Length of hind-quarter	19
Depth of chest	30
Length of fore-arm	16
Fore knee to foot	15
Croup to hock	36
Hock to foot	18½
Breadth of neck	16
Breadth of fore-arm	6
Breadth of thigh	6
Breadth of fore-leg	2½
Breadth of hind-leg	3
Length of horns	37
Breadth asunder at base	1
Breadth asunder at tips	9½
Length of ears	10
Breadth of head	9

A specimen of a marine snake (*Pelamys bicolor*) presented to the Museum by the Rev. William White, Wesleyan Missionary to the New Zealand Association, and which, with several others, had been picked up dead upon the beach on the west coast of that country, was upon the table; also another portion of the birds collected by Charles Darwin, Esq., to which Mr. Gould in continuation drew the attention of the Members.

January 23.

Richard Owen, Esq., in the Chair.

A selection of the *Mammalia* procured by Captain Alexander during his recent journey into the country of the Damaras, on the South West Coast of Africa, was exhibited, and Mr. Ogilby directed the attention of the Society to the new and rare species which it contained.

Among the former were the *Herpestes melanurus* and *Cynictis Ogilbii* of Dr. Smith, the *Canis megalotis*, &c. The latter consisted of five new species, which Mr. Ogilby characterized as follows:

Macroscelides Alexandri. Fur long and fine, very dark blue-black at the root, but pointed with pale sandy-red above, and white beneath; ears pretty large, subelliptical, and red behind; whole under lip red; *tarsi* white; tail long, hairy, and very much attenuated: length 5¾ inches; tail 4¾ inches.

Macroscelides melanotis. Of a rather larger size than the former, with large head, dark brown or black ears, rather sandy under lip, dunnish white throat and *abdomen*, but pale reddish brown chest; colour of the upper parts much the same, but rather more ashy; *tarsi* light brown; tail mutilated: length 6 inches.

Chrysochloris Damarensis. Brown, with a silvery lustre both above and below; a yellowish white semicircle extends from eye to eye, under the chin, covering the whole of the cheeks, lips and lower jaw; a very marked character which, as well as the peculiar shade of the colour, readily distinguishes it from the new species described by Dr. Smith: no tail: length 4½ inches.

Bathyergus Damarensis. A species intermediate in size between *Capensis* and *Hottentotus*: colour uniform reddish brown both above and below, with a large irregularly square white mark on the *occiput*, much larger than in *Hottentotus*, and another on each side of the neck just under the ears; these two meet on the throat, which is thus covered with dirty dunnish white; tail, a large flat stump covered with coarse reddish brown bristles, which stand out from it in all directions like *radii*; paws reddish brown: length 8¼ inches; tail ½ inch*.

Graphiurus elegans. Smaller than *Graph. Capensis* of Cuv., and of a purer and deeper ash colour above; the chin, throat, and cheeks are covered by a large patch of pure white, the rest of the under surface is mixed grey and ash, and all the *tarsi* and paws pure white: there is a mark of the same colour above and in front of each ear, and an oblique white stripe runs from the throat backwards over the

* This specimen, and the *Macroscelides melanotis*, were purchased for the British Museum, and the remaining three species for the Museum of the Zoological Society at the sale of Capt. Alexander's Collection, March 8, 1838.

shoulder, just in front of the arms; an intense black stripe passes from the commissure of the mouth, through the eye to the ear; the tail is covered with short coarse hair, pure white above, pure black below, and pencilled or shaded on each side; face greyish ash; whiskers abundant, and of a grey colour: length 5 inches; tail $2\frac{3}{8}$ inches.

Mr. Ogilby observed, that the above species, and the one described by F. Cuvier, under the name of *Graph. Capensis*, appeared to him to differ in no respect from the genus *Myoxus*, and that in characterising the present animal, he merely made use of the name *Graphiurus* to indicate its relation to that originally described by Cuvier.

Mr. Ogilby likewise called the attention of the Society to certain peculiarities in the structure of the hand, in a living specimen of a new species of *Galago*, which he proposes to call *Otolicnus Garnettii*, after the gentleman to whom he was indebted for the opportunity of describing it, and who has already conferred many advantages upon science by the introduction of numerous rare and new animals. The peculiarity of structure to which Mr. Ogilby alluded, consisted in the partially opposable character of the index finger of the fore hands, the fingers on these members being divided into two groups, composed of the thumb and index on one side, and the remaining three fingers on the other, as in the Koalas and Pseudocheirs. He remarked that the anterior index in all the inferior *Lemuridæ* was weak and powerless, and that it had the same tendency to divide with the thumb instead of the other fingers in the rest of the Galagos, as well as in the *Nycticebi*, *Microcebi*, *Cheirogalei*, and *Tarsii*, whilst in the Potto it was reduced almost to a tubercle. These genera consequently formed a little group analogous to the Koalas and Pseudocheirs among the *Didelphidæ*, being, exclusive of these animals, the only Cheiropeds in which this character occurs; and Mr. Ogilby regarded the fact as a strong confirmation of the truth of the relations which he had formerly pointed out as subsisting between these two families. The *Otolicnus Garnettii* is of a uniform dark brown colour on every part both above and below; the ears large, black, and rather rounded; the tail long, cylindrical and woolly; and the size of the animal about that of a small *lemur*, or considerably larger than *Oto. Senegalensis*.

A communication was then read to the Meeting by Prof. Owen, entitled, "Notes on the Anatomy of the Nubian Giraffe."

These notes contain the general results of the anatomical examination of three specimens of the Giraffe, which Mr. Owen had been so fortunate as to have the opportunity of dissecting; one of the three (a male) died in the Society's Menagerie, and the remaining two (male and female) were in the possession of Mr. Cross of the Surrey Zoological Gardens.

The author agrees with Cuvier in considering that the external characters of the Giraffe clearly indicate its position in the order *Ruminantia*, to be between the genera *Cervus* and *Antilope*; the true bony material of its horns, which are covered by a *periosteum* defended by hairy integument, resembling the growing antlers of the Deer; but the

non-deciduous character of this tegumentary covering to the *periosteum*, and the consequent permanency of the horns in the Giraffe, reminding us of the persistent nature of these organs as it obtains throughout the Antelopes.

The black callous integument on the upper surface in the horns, is noticed as a probable indication of a tendency to develope a superabundance of epidermic material; and Mr. Owen conceives that the strong black hair which grows in a matted tuft around their extremities may represent, in an unravelled state, the fibres composing the horny coverings of the core in the horns of the Antelope. A few examples occur among both Deer and Antelopes, in which the possession of horns is found in the two sexes, as in the Giraffe; but in this animal these organs present certain peculiar characters in the mode of their articulation to the skull, the basis of the horn being united by *sychondrosis* to the frontal and parietal bones, constituting an *epiphysis* rather than an *apophysis* of the *cranium*. With regard to the supposed occurrence of a third horn in the male Nubian Giraffe, as the osteological details bearing upon this point are given in that part of the memoir which embraces the description of the skeleton, Mr. Owen in this place merely observes, that the evidence afforded by the examination of the two individuals in question was rather opposed to, than in favour of its existence.

The general form of the Giraffe is obviously modified with especial reference to its exigencies and habits; the prolongation and extensibility of its hair-clad muzzle, the peculiar development, cylindrical shape and flexibility of its tongue; the oblique and narrow apertures of the nostrils, defended by hair and surrounded with cutaneous muscular fibres, enabling the animal to close them at will, and thus to protect the olfactory cavity from the fine particles of sand which in the storms of the desert would otherwise find ingress, are points referred to by the author as exhibiting marked adaptations of structure in especial harmony with a mode of life consequent upon the nature of its food and its geographical distribution.

For a description of the general external peculiarities of the body the author refers to Rüppell's Reise im Nordlichen Africa; Geoffroy in the Annales des Sciences, xi. p. 210; Salze, in the Mémoires du Museum, xiv. p. 68; and the 5th and 6th volumes of Sir E. Home's Comparative Anatomy.

Organs of Digestion.

The Giraffe differs from every other Ruminant in the form of the mouth, which resembles that of the Elk in the non-division and extensibility of the hair-clad upper lip, but differs widely from it in the elegant tapering shape of the muzzle. The muscles of the tongue, both as to number and arrangement, presented no peculiarities of importance, but the nerves were characterized by the beautiful wavy course in which they were disposed, and by which disposition they are accommodated to the greatly varying length of this organ. The erectile tissue, conjectured by Sir Everard Home to be present in the tongue of the Giraffe, and to be the cause of

its extension, has no existence: the only modifications of the vascular system worthy of notice were the large size and slight plexiform arrangement of the lingual veins at the under part of the base of the tongue. The inner surface of the lips, especially where they join to form the angles of the mouth, was beset with numerous close-set, strong, retroverted and pointed *papillæ*, similar to those distributed over the interior of the gullet in the *Cheloniæ*; a structure which is also present in other Ruminants.

The palate was beset with about sixteen irregular transverse ridges, having a free denticulate edge directed backwards; an apparatus for detaining the food, and insuring its deglutition, which Mr. Owen notices as especially required in the Giraffe, by reason of the small comparative size of its head and jaws: he also refers to the mechanical obstacles, which oppose the escape of the food when regurgitated, in the *Ruminantia* generally, as the presence of buccal *papillæ*, &c. as an evidence on which to found an argument of special adaptation or design. This structure is noticed by Cuvier, but considered by him as only coexistent with the occurrence of *papillæ* upon the lining membrane of the stomach, and as a condition of parts which furnishes no obvious indication of any connexion with final causes; with a view of showing that no such relation of coexistence as that imagined by Cuvier, in the presence of *papillæ* upon different portions of the alimentary canal, can be positively established, Mr. Owen instances the Turtle, which has these callous bodies in great abundance, but entirely restricted to the lining membrane of the *œsophagus*, in which situation their use is sufficiently apparent.

The *œsophagus* in size was found to be very regular and uniform throughout its entire length, being about an inch and three quarters in diameter, and surrounded with two strong layers of muscular fibres; the fibres being thickest, and arranged transversely in the external layers; those of the internal being oblique, with an approach towards a longitudinal disposition. These fibres on being examined with the microscope and compared with those of the stomach, were found by Mr. Owen to present a structure which he regards as intermediate between that which characterizes voluntary and involuntary muscular fibre; their ultimate filaments being aggregated into regular sized ultimate fascicles having a parallel disposition, and thus so far agreeing with the fibres of the voluntary muscles, but at the same time exhibiting an important structural difference in the total absence of transverse *striæ*; the fascicles in fact being perfectly smooth and substransparent.

The mucous membrane of the *œsophagus* was thick and firm, lined by a well-developed smooth *epithelium*, and connected to the muscular coat by a very lax cellular membrane.

As regards the position of the abdominal *viscera* in the female, the paunch occupied the ventral aspect of the anterior two-thirds of the short abdominal cavity, resting immediately upon the abdominal muscles and their strong elastic *fasciæ*. The great *omentum* which was studded reticularly with fat, as in the Ruminants generally, extended

from the paunch to below the brim of the *pelvis*: on raising it a fold of the *colon* appeared immediately below the paunch towards the left side; below this were several convolutions of the small intestines; the obtuse blind end of the *cæcum* made its appearance in the left hypogastric region, and below there was another portion of the great *colon*.

In the male the abdominal *viscera* presented nearly the same appearances; on raising the paunch the spiral coils of the *colon* (characteristic of the Ruminants) came into view, together with the rest of the *jejunum* and *ilium*, upon the removal of which the third and fourth stomachs, and the small liver wholly confined to the right of the mesial plane, were exposed.

The spleen, as usual in the *Ruminantia*, had its concave surface applied to the left side of the first stomach or *rumen*.

The *pancreas* extended transversely behind the stomach within the posterior duplicature of the *omentum* from the spleen to the *duodenum*.

The kidneys occupied the usual position in the loins, the right one a little more advanced than the left; their figure was rounded and compact, as in the Deer and Antelopes, and they were not externally lobated as in the Ox.

The cells of the *reticulum*, as in the Reindeer, were extremely shallow, their boundaries appearing only as raised lines; but there was the same form and grouping of the cells as obtains throughout the Ruminants generally, the arrangement being that by which the greatest number are included in the least possible space.

The folds of the *psalterium* resembled those of most other Ruminants, each two narrow folds having alternately placed between them one of great and one of moderate breadth.

In the fourth stomach the *rugæ* of the digestive membrane were slightly developed, and chiefly longitudinal; the *pylorus* was protected by a valvular protuberance placed above it just within the stomach.

The *duodenum*, which was dilated at the commencement, received the biliary and pancreatic secretions about ten inches from the *pylorus*.

The small intestines were rather tightly bound to the spine in short coils by a narrow mesentery; their diameter was about four inches.

The *ilium* ceases to be convolute towards its termination, ascending in a straight course, and entering the *cæcum* near the root of the mesentery.

The *cæcum* was a simple cylindrical gut, as in other Ruminants; its circumference about six inches.

The disposition of the *colon* resembled that of the Deer; it extended about eight feet before the spiral turns commenced, there it narrowed, and the separation of the *fæces* into pellets began at this point. The coils were not in exactly the same plane, but formed a depressed cone, with its concavity next to the mesentery, on the left of which the coils were disposed. There were four complete gyrations in one direction, having the same number of reverse coils in

their interspace. This part of the intestine measured fourteen feet in length.

The length of the intestines was as follows:

	Cross's Female.	Cross's Male.	Zool. Male.
Small....	91 ft. 0 in.	88 ft.	82 ft.
Large ...	43 2	43	40
Cæcum ..	2 2	2	2

The liver weighed six pounds eleven ounces avoirdupois; it consisted of one lobe of a flattened form, with a small posterior spigilean process.

The presence of a gall-bladder, distinguishing the hollow-horned from the solid-horned Ruminants, made the investigation of this point in the anatomy of the Giraffe one of extreme interest; and Mr. Owen remarks, that the result of his examination of three individuals shows the caution which should be exercised in generalizing upon the facts of a single dissection.

In the first Giraffe (Mr. Cross's female) a large gall-bladder was present, having the ordinary position and attachments, but presenting the unusual structure of a bifid *fundus*. Upon making a longitudinal incision down its side, it was found to be divided throughout its length by a vertical *septum* of double mucous membrane, forming two reservoirs of equal size; the organ in fact was double, each bladder having a smooth lining membrane, and communicating separately with the commencement of a single cystic duct.

In the two Giraffes subsequently dissected not a vestige of this organ could be detected, the bile in them being conveyed by a rather wide hepatic duct to the *duodenum*. Mr. Owen therefore concludes that the absence of the gall-bladder is the normal condition, and that the Giraffe in this respect has a nearer affinity to the Deer than to the Antelopes.

The *pancreas* was broader, thinner, and of a more irregular form than in the calf or human subject; it was attached on the left side to the *diaphragm* and posterior part of the stomach, extending transversely across the spine to the termination of the biliary duct.

The spleen was of a tolerably regular oval form, but very thin, not exceeding one inch and two-thirds at the thickest part.

In the chest the *viscera* presented the usual disposition.

Sanguiferous System.

The heart measured in the full length of the ventricles eight inches and a half, and the same in the transverse diameter of the base. The auricles were small as compared with the ventricles, which form a rounded cone. The right ventricle terminated two inches from the apex. The left flap of the tricuspid valve had its free margin attached by long *chordæ tendineæ* to the *septum ventriculorum* on one side, and to a single *columna carnea* on the other, which *columna* also gave attachment to some of the *chordæ tendineæ* of the right flap of the tricuspid; the rest of the *chordæ* of this flap, and all the *chordæ* of

the third or internal flap, were attached to a very short and thick *columna*, arising from the *septum*; below the left flap of the tricuspid valve was a fleshy column, connecting the wall of the right ventricle to the *septum*.

At the origin of the *aorta* there was a single small curved bone.

The arch of the *aorta*, after distributing the vessels to the heart, gave off, first, a large *innominata*, which subdivided into the right vertebral artery, the right brachial artery, and the common trunk of the two carotids; secondly, the left brachial artery; thirdly, the left vertebral artery. The common trunk of the two carotids was remarkable for its length. The cranial *plexus* of the internal carotid was much less developed than in the ordinary grazing Ruminants.

Nervous System.

The brain of the Giraffe closely resembled, in its general form, and in the number, disposition, and depth of the convolutions, that of the Deer: it was more depressed than in the Ox, and the *cerebrum* was wholly anterior to the *cerebellum*. The anterior contour of the cerebral hemispheres was somewhat truncated.

The convolutions might be readily divided, as in other Ruminants, into primary and secondary; they averaged a breadth of three lines, and were almost symmetrical in the two hemispheres. There was little symmetry in the disposition of the primary convolutions in the *cerebellum*: the middle one on the upper surface, representing the superior vermiform process, pursued a wavy course from side to side, but the inferior vermiform process was straight, and very prominently developed; these, with the lateral convolutions of the *cerebellum*, were subdivided by narrow and, for the most part, transverse folds. Mr. Owen also enters into a detailed account of the internal structure of the brain; and concludes his description of this organ by giving the following admeasurements:

	Inches.	Lines.
Total length of the brain	5	3
Vertical diameter of ditto.....	2	8
Breadth of the *cerebrum*.....	4	3
Length of the *cerebellum*	1	10
Breadth of ditto.	2	5
Length of *pons varolii*.....	1	0
Breadth of ditto.	1	6

Weight of the brain, 14oz. avoirdupois.

The olfactory nerves were large, as in most *Ruminantia*, and terminated in expanded bulbs, in length 1½ inch, in breadth 1 inch: these were lodged in special compartments of the cranial cavity. The optic nerves and ninth pair were relatively larger than in the Deer. The other cerebral nerves presented no peculiarity.

The spinal chord had a close investment of *dura mater*, and was remarkable for the great length of its cervical portion, which, in the Giraffe dissected at the Zoological Gardens, measured upwards of three feet, the entire length of the animal from the muzzle to the vent being eight feet. Mr. Owen here particularly describes the appearance in the origins of the cervical nerves depending upon the

elongation of this part of the spinal chord; the space between the lower filaments forming the root of one nerve, and the upper filaments of the root of the succeeding nerve was not more than the space between the individual filaments of each root; whence it would seem that the elongation of the cervical portion of the chord was produced by a general and uniform interstitial deposition during fœtal developement, which thus effected an equable separation of these filaments; so that a single nerve, as in the case of the third cervical, might derive its origin from a space extending six inches in length.

The brachial *plexus* was principally formed by the first two dorsal nerves; seventeen pairs intervened between it and the large nerves forming the lumbar *plexus*.

The recurrent nerves were formed by the reunion of several small filaments derived from the *nervus vagus* at different parts of its course down the neck, instead of originating as usual in the *thorax*, and being reflected, as a single nerve, round the trunks of the great vessels.

The sympathetic nerve in the neck was found to present five ganglionic enlargements of various sizes.

Muscles.

In the dissection of the abdominal muscles no peculiarity of importance was noticed; but in the neck there existed a highly interesting modification of the parts which effect the retraction of the *os hyoides*. The pair of muscles which, as in some other Ruminants, combines the offices of *sterno-thyroideus* and *sterno-hyoideus*, arose in the Giraffe by a single long and slender carneous portion from the anterior extremity of the *sternum*; this fleshy origin was nine inches long, and it terminated in a single round tendon six inches in length; the tendon then divided into the two muscles, each division becoming fleshy, and so continuing for about 16 or 18 inches; then each muscle again became tendinous for the extent of two inches, and ultimately carneous again, prior to being inserted in the side of the thyroid cartilage, and continued thence in the form of a *fascia* into the *os hyoides*.

Mr. Owen observes that this alternation of a non-contractile with a contractile tissue, as exhibited by the above structure, displays in a most striking manner the use of tendon in regulating the amount of muscular contraction. Had the *sterno-thyroideus* been muscular throughout its entire length, the contraction of its fibres would have been equal to draw down the *larynx* and *os hyoides* to an extent quite incompatible with the connections of the adjacent parts; but the intervention of long and slender tendons duly apportions the quantity of contractile fibre to the extent of motion required.

The muscle analogous to the *omo-hyoideus* of other animals was adjusted to its office by a more simple contrivance, arising from the third cervical *vertebra* instead of the *scapula*, the diminished length of the muscle enabling it to act upon the *os hyoides* with the requisite power of contraction.

Mr. Owen remarks that the analogue of the *sterno-mastoideus*

should be called *sterno-maxillaris*, its insertion being by a slender tendon into the inner side of the angle of the jaw, after continuing fleshy to within a foot of its place of attachment.

The *scaleni* muscles, which were most powerfully developed, consisted of four distinct masses on each side, arising from the fourth, fifth, sixth, and seventh cervical *vertebræ*; they were inserted into the *manubrium sterni* and the first rib.

The *trapezius* consisted of two portions; one, arising from the transverse processes of the fifth and sixth cervical *vertebræ*, is lost in a strong *fascia* overspreading the shoulder-joint; the other arises from the *ligamentum nuchæ*, and is inserted into the *fascia* covering the *scapula*.

The *levator scapulæ* arose from the fifth, sixth, and seventh cervical *vertebræ*, and was inserted into the superior angle of the *scapula*.

The *rhomboideus* was single, and chiefly remarkable for its shortness; it was inserted into the broad elastic cartilage which is continued upwards from the base of the *scapula*.

The *pectoralis major* arose from the whole length of the *sternum*; it was composed of two portions, one superficial, the other deep seated; the former was inserted into the *fascia* covering the extensor muscles of the fore-leg; the latter into the *fascia* covering the brachial *plexus*.

With respect to the other muscles acting upon the distal joints of the extremities, with the exception of their greater length, they were not found materially to differ from the corresponding parts in other bisulcate mammals.

The *ligamentum nuchæ* was remarkable for its prodigious developement; it commenced at the sacral *vertebræ*, and receiving, as it advanced, accessions from each of the lumbar and dorsal *vertebræ*, became inserted into the spinous processes of the cervical, the extreme portion passing freely over the *atlas*, and terminating by an expanded insertion upon the occipital crest.

The bony attachment of the ligament afforded by the skull was raised considerably above the roof of the cranial cavity, the exterior table of the skull being widely separated from the vitreous plate by large sinuses, which commencing above the middle of the nasal cavity extended as far posteriorly as beneath the base of the horns; the sinuses were traversed by strong bony *septa*, forming a support to the exterior table. The sphenoidal sinuses were of large size.

The nasal cavity occupied the two anterior thirds of the skull, and the *ossa spongiosa* were proportionably developed.

The condyles of the *occiput* were remarkable for their great extent in the vertical direction, and the inferior and posterior parts of the articular surface meet at an acute angle; a structure which enables the Giraffe to elevate the head into a line with the neck, and even to incline it slightly backwards.

Male Organs of Generation.

The *testes* were elongate, oval, and situated in a short *scrotum*, on each side of which were the rudiments of two *mammæ*.

The *vasa deferentia* pursued the same course as in the Deer; they became slightly enlarged at the terminal two inches of their course, and the secreting surface of their lining membrane was augmented by various irregular folds and sinuses.

The *prostate* in being formed of two separate glands presented the true ruminant character; but the lobes themselves, as is the case with several of the typical ruminants, presented their own peculiar modification, each lobe at its distal extremity forming a large round bulbous body, the rest of the lobe diminishing towards its urethral portion.

Two Cowperian glands, each as large as a nutmeg, were situated at the base of the bulb of the *urethra*, surrounded by a special capsule of muscular fibres; they had no single central cavity, but three or four sinuses conveyed the secretion to the duct, which terminated in the bulbous part of the *urethra*.

The *penis*, when retracted, assumed the sigmoid form, as in other ruminants, the muscles producing the sigmoid retraction being inserted upon the sides of the *corpora cavernosa*, near the base of the *glans*. There was no *septum* dividing the cavernous texture of the *penis*.

The *glans* began by a somewhat sudden expansion, and continued to enlarge to its distal extremity, which was smooth and rounded. The prepuce was reflected upon the extremity, and not upon the root of the *glans*, so that its division only exposed a small portion of the latter. The urethral canal did not open upon the extremity of the *glans*, but was continued forwards for an inch and a half, attached to the inside of the prepuce, its *parietes* being merely membranous, and its extremity projecting freely, like a membranous bilabiate tube, about a line beyond the inner surface of the prepuce. A similar structure obtains in some other ruminants, as the Ram.

Female Organs.

The *ovaria* were irregularly oval, sub-compressed bodies, an inch and a half in length and one in breadth. The fallopian tubes had the margins of their expanded extremities almost entire. They open at the outer margin of a wide ovarian capsule, which does not, however, inclose the ovary. The inner surface of the pavilion is beset with numerous minute *plicæ*, which converge towards the orifice of the oviduct or fallopian tube; a few small but broad folds immediately surround the opening.

The external orifice of the common *vagina* resembled that of the Deer, in coming to a point, within which the *clitoris* was lodged. From this orifice to the communication with the *urethra*, measured five inches, and the length of the proper *vagina* six inches. The

vagina was lined by a smooth and polished membrane, disposed in numerous fine longitudinal *rugæ*. The *os tincæ* was a large, transversely oval prominence, having the orifice of the *uterus* in the centre. The length of the common *uterus* was two inches. The *cervix* was occupied by two circular series of close-set, short, longitudinal lamellar processes, about two lines in breadth, which projected from the *parietes* of the *uterus*, and had their free margins converging to the centre of the canal. Above these, the inner membrane of the *uterus* sent off several thickened processes. Each *cornu* of the *uterus* was about eight inches in length, and became bent in a spiral form when distended with fluid: four longitudinal rows of flattened processes projected from the inner surface, showing that the *fœtus* is developed in the Giraffe by means of a cotyledonous subdivided *placenta*, as in other horned Ruminants, and not, as in the Camel, by an uniform vascular villosity of the *chorion*.

February 13th, 1838.

William Yarrell, Esq., in the Chair.

Mr. Martin exhibited an insectivorous animal which had fallen under his observation in examining a collection of specimens, presented some time since to the Museum, by the late William Telfair, Esq.

In the Zoological Proceedings for 1833, reference is made to a letter of Mr. Telfair's, accompanying a very young insectivorous animal, known to the natives of Madagascar by the name "Sokinah," and which Mr. Telfair was disposed to refer to the genus *Centenes*. The above specimen being only seventeen days old, its characters could not be satisfactorily determined; but the present animal, which Mr. Martin considers to be the adult of the same species, appears to be more nearly related to the genus *Erinaceus* than *Centenes*; but at the same time it differs so materially in the character of its dentition, as to warrant the establishment of a new genus for its reception. Mr. Martin therefore proposed to characterize it under the generic appellation of *Echinops*, with the specific title of *E. Telfairi*, in memory of the lamented and zealous Corresponding Member of the Society from whom it had been received.

ECHINOPS.

Corpus supernè spinis densis obtectum.

Rostrum breviusculum.

Rhinarium, aures, caudaque ut in *Erinaceo*.

Dentes primores $\frac{1}{2}$, superiorum duobus intermediis longissimis, discretis, cylindraceis, antrorsùm versis; proximis minoribus.

Canini $\frac{1-1}{0-0}$.

Molares $\frac{5-5}{7-7}$; utrinsecùs antico 1mo suprà, et 3^{bus} infrà spuriis; reliquis, ultimo suprà excepto, tricuspidatis, angustis, transversìm positis; ultimo suprà angustissimo; molaribus infrà inter se ferè æqualibus, ultimo minore.

Pedes 5-dactyli, ambulatorii; halluce breviore; unguibus parvulis, compressis; plantis denudatis.

ECHINOPS TELFAIRI. *Ech. auribus mediocribus, subrotundatis intùs atque extùs pilis parvulis albidis obsitis; capite supernè pilis fuscis; buccis, mystacibus corporeque subtùs sordidè albis, spinis fuscescenti-albis ad basin, apicibus castaneis; caudâ vix apparente.*

	unc.	lin.
Longitudo *corporis* totius	5	2
——— ab apice rostri ad auris basin ..	1	2
——— *tarsi, digitorumque*	,,	10$\frac{3}{4}$
——— *auris*	,,	5

Habitat. Madagascar?

"*Sokinah*" of the Natives of Madagascar?

In the *upper jaw* the incisors are four in number, and apart; the two middle are large, sub-cylindrical, elongated, and placed at the apex of the jaw; the two others are small, and seated behind the former. Separated from these by a small space, succeed the canines, similar in character to the incisors, but stouter and with a slight posterior notch. The molars are five on each side: the first false and simple; the three next transversely elongated, with two external tubercles in contact, and one internal; hence their crowns assume the form of an elongated triangle, the apex being internal; the fifth molar is a slender *lamina* transversely placed, but not advancing so far laterally as the molar preceding it.

The *under jaw* presents two small incisors, somewhat apart from each other, and directed obliquely forwards; behind these there follow on each side in succession three larger and conical teeth, directed obliquely forwards, and which may be regarded as *false molars*. Separated from the last of these by a small space, succeed four molars on each side, vertical and smaller than those above, with two tubercles internally and one externally, so that the worn surface is triangular, with the apex outwards; the last is the smallest: the surfaces of all are apart, but their bases are in contact.

Mr. Martin observes, that this system of dentition (very distinct from that which characterizes the Tenrecs, (*Centenes*,) and the genus *Ericulus* of Isidore Geoffroy) presents us with characters which decidedly separate *Echinops* from *Erinaceus*, notwithstanding their approximation. In *Erinaceus* the upper incisors are six; there are no canines, but three false molars on each side, and four true molars, of which the last is small and narrow; the others square, with two outer and two inner tubercles; while in the lower jaw, the incisors, two in number, are very large, followed on each side by two false molars, and four true molars. In *Echinops*, as in *Erinaceus*, the feet have five toes; the thumb of the fore-feet is small and seated on the wrist, the other toes are small, and armed with feeble, compressed, hooked claws, the last toe the smallest: the toes of the hind-feet resemble those of the fore-feet, and the inner and outer are the smallest. The snout, ears, tail, and spiny covering of the upper surface of the body, as in *Erinaceus*.

In addition to the above description of the external characters of *Echinops*, Mr. Martin communicated to the Meeting some details of the anatomy of the soft parts, but the condition of the specimen was not such as to enable him to give any very complete account of the appearances presented by the internal organs.

The skull, as compared with that of *Erinaceus*, was proportionally very inferior in size; it was more level above, and narrower, the cranial cavity being contracted, and the muzzle shorter. The occipito-parietal ridge was elevated, the zygomatic arches were almost obsolete. The palate was narrow, and the posterior *foramina*, which in the hedgehog are large open fissures, were reduced to minute orifices.

The *pelvis* was very narrow, and the pubic bones were separate in front.

The vertebral *formula* was as follows:

Cervical	7
Dorsal	15
Lumbar	7
Sacral	2
Coccyeal	8?

The ribs consisted on each side of 8 true and 7 false.

Mr. Yarrell exhibited a recently preserved example of a new species of Swan, closely allied in external appearance to the well-known Domestic Swan, but having the legs, toes, and interdigital membranes of a pale ash-grey colour, which in the *Cygnus olor*, Ill., are deep black. Mr. Yarrell observed, that this species had been known to him for some years past as an article of commerce among the London dealers in birds, who receive it from the Baltic, and distinguish it by the name of the Polish Swan. In several instances, these swans had produced young in this country, and the cygnets when hatched were pure white, like the parent birds, and did not assume at any age the brown colour borne for the first two years by the young of all the other known species of White Swans. Mr. Yarrell considered that this peculiarity was sufficient to entitle the bird to be ranked as a distinct species, and in reference to the unchangeable colour of the plumage, proposed for it the name of *Cygnus immutabilis*.

During the late severe weather, flocks of this swan were seen pursuing a southern course along the line of our north-east coast, from Scotland to the mouth of the Thames, and several specimens were obtained. The specimen exhibited belonged to the Rev. L. B. Larking, of Ryarsh Vicarage, near Maidstone, for whom it had been preserved. It was shot on the Medway, where one flock of thirty, and several smaller flocks were seen.

Mr. Waterhouse exhibited a new species of Squirrel from the Society's Museum, and characterized it as:

Sciurus sublineatus. *Sc. suprà fusco-olivaceus flavescente lavatus; lineis dorsalibus quatuor nigris tribus albescentibus, a humeris ad uropygium excurrentibus: abdomine flavescente: caudâ nigro flavoque annulatâ.*

	unc.	lin.
Longitudo *corporis* ab apice rostri ad caudæ basin..	6	0
——— ab apice rostri ad auris basin.....	1	2½
——— *caudæ* (pilis inclusis)	0	5
——— *tarsi digitorum*que	1	2¼
——— *auris*	0	2½

Habitat ——— ?

"This animal is less than the Palm Squirrel (*Sciurus palmarum*, Auct.), but like that species has four dark and three pale lines on the back: these lines, however, are very narrow, and occupy only the central portion of the back; they are not continued on to the shoulders, neither do they extend over the haunches. The general colour is

olive-brown, a tint arising from the hairs being each minutely annulated with deep yellow and black. The throat, chest, and rump, are whitish, and the belly is yellow. The hairs covering the feet above are annulated like those of the body, but of a deeper tint. The tail is cylindrical and rather slender, and exhibits obscure annulations, each hair being annulated with deep golden yellow and black. The fur is short and soft, that on the back is grey at the base; on the under parts the hairs are very obscurely tinted with grey at the base. The hairs of the moustaches are numerous, moderately long, rather slender, and of a black colour. The head is very nearly uniform in colour with the body, it is however less yellow."

Mr. Blyth called the attention of the Society to a peculiarity in the structure of the feet in the *Trogonidæ*, which he thought had not been previously noticed. This family, although *zygodactylous*, have the toes disposed on quite a different principle from the Woodpeckers, Parrots, and other birds, which present an analogous structure; their first and second toes being opposed to the third and fourth, in lieu of the first and fourth to the second and third, in consequence of which, that toe, which corresponds to the middle one in birds that are not yoke-footed, that is to say, the third or longest toe, is the inward of the two forward toes in the *Trogon* family, and the outward in the Woodpeckers and Parrots.

A continuation of Mr. Owen's paper, on the Anatomy of the Giraffe was then read, embracing the principal features of interest in the osteological peculiarities of this animal.

The author, in the first place, details the result of his investigation into the evidence bearing upon the supposition of there being in the male Nubian Giraffe a third horn, situated anteriorly in the mesial line of the *cranium*.

Upon making a section of the skull of the male Cape Giraffe, the anterior protuberance was shown to be due only to a thickening and elevation of the anterior extremities of the frontal, and the contiguous extremities of the nasal, bones; and in the Nubian Giraffe the existence of a third distinct bony *nucleus* was also satisfactorily negatived; for, upon macerating the skulls of individuals which had not attained the adult age, the posterior horns became detached from the bones of the *cranium*; but no such separation took place in respect to the protuberances forming the supposed third horn, which would have been the case had its relation to the *cranium* been that of a distinct *epiphysis*.

In both the Cape and Nubian Giraffe, the horns were placed immediately over the coronal suture, which traversed the centre of their expanded bases. The frontal bones were distinct and joined by a well-marked suture, continued along the posterior two-thirds of the frontal protuberance, or as far as the nasal bones. The sagittal suture was persistent on both sides external to the horns. The parietal bone was single and anchylosed with the occipital and interparietal bones.

The male Giraffe, in both the Cape and Nubian varieties, has the horns nearly twice as large as those of the female; the expanded bases of the horns also in the former, meet in the middle line of the skull, but in the female the bases of the horns are at least two inches apart.

The nasal bone was bifurcate at its anterior extremity as in the Deer, not simply pointed as in most of the Antelopes.

With respect to the cervical *vertebræ* of the Giraffe, Mr. Owen observes, that they are not only remarkable for their great length, but also, as has been recently shown by Dr. Blainville, for the ball and socket form of the articulations of their bodies; the convexity being on the anterior extremity, and the concavity posteriorly, agreeing in this particular with the *vertebræ* of the Camel.

The *axis* was joined to the *atlas* by the anterior extremity of its body and the *processus dentatus*, which were blended in one common articulation, and inclosed in one capsular ligament, The spinous process of the *axis* was developed from the whole longitudinal extent of the superior arch, but had a very slight elevation. In the rest of the cervical *vertebræ*, the spinous processes were thin triangular *laminæ*, their *apices* rising about an inch and a half from a broad base resting upon the middle of the superior arch. Processes, analogous to the inferior transverse processes in the Crocodile, extended downwards and outwards from the lower part of the anterior extremity of each of the cervical *vertebræ* (except the *atlas* and *dentata*), but of much smaller size than the corresponding processes in the Camel.

The perforations for the vertebral arteries were large, and present in the seventh as well as in the rest of the cervical *vertebræ*; they were situated above the transverse processes in the side of the bodies of the *vertebræ* at the base of the superior *laminæ*. Mr. Owen observes, that although this position of the arterial *foramina* is somewhat peculiar, yet, in this respect, the Giraffe comes nearer the horned Ruminants than the long-necked *Camelidæ*.

In viewing the vertebral column of the Giraffe from above, the cervical *vertebræ* are seen to present the broadest bodies; of these the third and fourth are the narrowest and longest, the rest gradually increasing in breadth and diminishing in length to the seventh: the dorsal *vertebræ* thence grow narrower to the ninth, after which the *vertebræ* increase in breadth chiefly by the progressive development of the transverse processes.

The *sacrum* consisted of four *vertebræ* anchylosed together, but of these only the first articulated with the *ilium*.

Mr. Owen gives the following as the vertebral *formula* of the Giraffe.

Cervical	7
Dorsal	14
Lumbar	5
Sacral	4
Caudal	20

The number of ribs was fourteen pairs, seven true and seven false. The first pair was straight, the rest became gradually more and more curved to the last. They increased in length to the eighth, and then gradually became shorter: in length the increase was to the fifth, from which they gradually became narrower.

The *sternum* consisted of a single series of six bones, and an ensiform cartilage; it was chiefly remarkable for its great curvature. The first sternal bone was the narrowest and longest; the succeeding ones progressively diminished in length, and increased in thickness.

As the osteology of the Giraffe has been illustrated by Pander and D'Alton, and also described with more detail in the second edition of Cuvier's *Leçons d'Anatomie Comparée*, Mr. Owen considers it unnecessary to treat at large of the rest of the skeleton, merely giving a brief notice of the several bones of the extremities: in conclusion, he remarks that the order *Ruminantia*, perhaps the most natural in the mammiferous class, if we look to the condition of the organs of nutrition, presents, however, more variety than any of the carnivorous orders, in the local development of the organs of relation, and the consequent modification of external form: the most remarkable of these modifications is undoubtedly that which we admire in the Giraffe, and the anatomical peculiarities, which its internal organization presents, are principally confined to the skeleton in respect to the proportions of its different parts; and to those parts of the muscular and nervous systems immediately relating to the local peculiarities in the development of the osseous framework.

February 28, 1838.

Richard Owen, Esq., in the Chair.

Some observations were made by M. Bibron upon two European species of *Triton* indigenous to this country, *Triton cristatus* and *Trit. marmoratus*, which many naturalists consider to have been erroneously separated. M. Bibron, however, entertains no doubt whatever of their being really distinct, and pointed out a character by which he states they may readily be distinguished, and which he believed to have been hitherto unnoticed. This distinction consists in the form of the upper lip, which in *Triton cristatus* is so largely developed as to overlap the under lip posteriorly when the jaws are closed, a condition never present in *Trit. marmoratus*.

Mr. Ogilby exhibited and characterized, under the name of *Macropus rufiventer*, a new species of Kangaroo which Mr. Gould had received from Tasmania, where it is known by the name of Wallabee. The external incisor tooth of the upper jaw was marked by a duplication or fold: the general colour of the animal above was grayish brown, considerably darker than the wild rabbit, and copiously intermixed on the back with pure black hairs, which in certain lights gives this part a perfectly black appearance; the paws and outer surface of the fore-legs are of the same colour; the *tarsus* and hind paws brown; the chin, throat, belly, and abdomen, sandy red, more or less intense; ears yellowish red within, brownish black without; tail rather short, dark brown above, dirty yellowish on the sides, naked, and granulated two-thirds of its length on the under surface; claws long and pointed; nose naked; length of body 2 feet; of tail 1 foot 2 inches.

Mr. Waterhouse exhibited a drawing, and the tail and jaws of a new species of *Delphinus*, which he characterized as

DELPHINUS FITZROYI. *Delph. suprà niger; capitis corporisque lateribus, corporeque subtùs, niveis; caudâ, pedibus, labioque inferiore, nigris; fasciis latis duabus per latus utrumque obliquè excurrentibus, hujusque coloris fasciâ utrinque angulo oris ad pedem tendente.*

	ft.	in.	lin.
Total length (measuring along curve of back).....	5	4	0
Length from tip of muzzle to vent	3	10	9
Length from tip of muzzle to dorsal fin	2	6	5
Length from tip of muzzle to pectoral.....	1	4	5
Length from tip of muzzle to eye.....	0	9	9
Length from tip of muzzle to breathing aperture (following curve of head)	0	10	7

	ft.	in.	lin.
Length from tip of muzzle to angle of mouth	0	7	9
Length of dorsal fin (along the anterior margin)	1	0	5
Height of ditto	0	6	4
Length of pectoral, (along anterior margin)	1	2	8
Width of tail	1	4	5
Girth of body before dorsal fin	3	0	6
Girth of body before pectoral fin	2	8	2
Girth of body before tail fin	0	7	8
Girth of head over the eyes	2	0	0

Habitat, Coast of Patagonia, lat. 42° 30′. (April).

"This species, which I have taken the liberty of naming after Captain Fitzroy, the Commander of the Beagle, approaches, in some respects, to the *Delphinus superciliosus* of the 'Voyage de la Coquille,' but that animal does not possess the oblique dark-gray bands on the sides of the body; it likewise wants the gray mark which extends from the angle of the mouth to the pectoral fins. In the figure, the under lip of the *Delph. superciliosus* is represented as almost white, whereas in the present species it is black: judging from the figures, there is likewise considerable difference in the form. The figure which illustrates this description agrees with the dimensions, which were carefully taken by Mr. Darwin immediately after the animal was captured, and hence is correct."

Mr. Gould exhibited two species of the genus *Ptilotis*, which he characterized as *Ptil. ornata*, and *Ptil. flavigula*.

Ptilotis ornata. *Ptil. vertice, alarum marginibus externis, nec non caudæ olivaceis; dorso uropygioque brunneis; gulâ, genisque olivaceo-fuscis; pectore corporeque subtùs cinerescentibus, singulis plumis notâ latâ brunneâ in medio ornatis; crisso pallidè badio plumis fusco striatis, penicillâ nitidè flavâ utrumque colli latus ornante; notâ longitudinali sub oculos olivaceâ; primariis rectricibusque caudæ fuscis, his ad apicem externum albis; rostro nigrescente; pedibus brunneis.*

Long. tot. $6\frac{1}{2}$ unc.; *rostri*, $\frac{3}{4}$; *alæ*, $3\frac{2}{5}$; *caudæ*, $3\frac{1}{5}$; *tarsi*, $\frac{3}{4}$.

Hab. Swan River, Australia.

Ptilotis flavigula. *Ptil. capite, nuchâ, genis, corporeque inferiore nigro-griseis, hoc colore apud abdomen crissumque olivaceo tincto; plumis auricularibus argenteo-cinereis et post has guttâ flavâ; gulâ flavâ; alis, dorso, caudâque, flavescenti-olivaceis; femoribus olivaceis; rostro pedibusque nigrescentibus.*

Long. tot. 8 unc.; *rostri*, 1; *alæ*, $4\frac{1}{4}$; *caudæ*, $4\frac{1}{4}$; *tarsi*, 1.

Hab. Van Diemen's Land and New South Wales.

March 13th, 1838.

William Yarrell, Esq., in the Chair.

Mr. Ogilby read a letter from Mr. V. der Hoeven, in which the writer expresses his belief that the large Salamander preserved in a living state at Leyden ought to be regarded as a species of Harlan's genus *Menopoma*; its specific characters consisting in the absence of the branchial apertures, which are present in the species upon which Harlan founded his genus. M. V. der Hoeven thinks it probable that the branchial apertures were present in the Leyden Salamander in the young state, and he proposes to adopt the generic term *Cryptobranchus* in preference to that of *Menopoma*, and to give it the specific name of *Japonicus*. He further states that his observations upon this singular reptile will shortly be published in a Dutch Journal.

Mr. Owen observed, with reference to the opinion of M. V. der Hoeven respecting the relations of the Gigantic Salamander of Japan to the *Menopome* of the Alleghany Mountains, that the persistence of branchial apertures was a structure so likely to influence not only the habits of an amphibious reptile, but also the structural modifications of the osseous and vascular parts of the respiratory organs, as to render it highly improbable that the *Menopome* should be related generically to a species having no trace of those apertures. He thought, therefore, that the question of the *Menopome* and gigantic Japanese Salamander being different species of the same genus, could be entertained only on the supposition, that the branchial apertures were a transitional structure in the former reptile as they are in the latter. That this was the case he considered as highly improbable; for, besides the ossified state of the hyoid apparatus, there was evidence in the Hunterian Collection that both the male and female generative organs in the *Menopome* have arrived at maturity without any change having taken place in the condition of the branchial apparatus usually considered as characteristic of the *Menopome*. He therefore considered it to be undoubtedly generically distinct from the gigantic Salamander of Japan, the true affinities of which could only be determined satisfactorily after a complete anatomical investigation, especially of its sanguiferous, respiratory, and osseous systems.

Mr. Ogilby exhibited a drawing, made by Major Mitchell, of a Marsupial animal found by that officer on the banks of the river Murray, during his late journey in the interior of New South Wales. Mr. Ogilby stated his original belief that the animal in question belonged to the *Perameles*, under which impression he had proposed to name it *Per. ecaudatus*, from its entire want of tail, a cha-

racter found in no other species of the same group; but a drawing of the fore-foot, afterwards found by Major Mitchell, and likewise exhibited to the Society on the present occasion, had considerably shaken this first opinion, and induced Mr. Ogilby to suspect that the animal may eventually form the type of a new genus. According to Major Mitchell's drawing, and the notes which he took at the time of examining the specimen, it would appear that there were only two toes on the fore-feet, which were described as having been so perfectly similar to those of a pig, as to have procured for the animal the name of the pig-footed bandicoot, among the persons of the expedition.

The drawing of the foot, in fact, very closely resembles that of the genus *Sus* in form and characters; two toes only are represented, short, and of equal length; but there is a swelling at the base of the first *phalanges*, which renders it probable that there may be two smaller ones behind. The *Perameles*, on the contrary, have three middle toes on the fore feet, all of equal length, and armed with very long, powerful claws, besides a small rudimentary toe very distinctly marked on each side. The form and character of the hind feet were perfectly similar to those of the *Perameles*; as were also the teeth, as far as could be judged from the drawing, except that the canines did not appear to surpass the anterior molars in point of size. The ears were long, elliptical, and nearly naked; the head broad between the ears, and very much attenuated towards the muzzle, the body about the size of a small rabbit, and the fur very much of the same quality and colour as in that animal. Mr. Ogilby, after expressing his confidence in the fidelity of Major Mitchell's drawings, and the care with which that gentleman assured him he had made the observation in question, expressed his belief that this animal would be found to constitute a new genus of Marsupials, and proposed for it the provisional name of *Chæropus*, in allusion to the described characters of the fore feet.

The following is the notice of this animal inserted by Major Mitchell in his journal, on the occasion of first discovering it. "June 16, 1836. The most remarkable incident of this day's journey was the discovery of an animal of which I had seen only a head in a fossil state in the limestone caves of Wellington Valley, where, from its very singular form, I supposed it to belong to some extinct species. The chief peculiarity then observed was the broad head and very long, slender snout, which resembled the narrow neck of a wide bottle; but in the living animal the absence of a tail was still more remarkable. The feet, and especially the fore legs, were also singularly formed, the latter resembling those of a Pig; and the marsupial opening was downwards, and not upwards, as in the Kangaroo and others of that class of animals. This quadruped was discovered by the natives on the ground; but on being chased it took refuge in a hollow tree, from which they took it alive, all of them declaring that they had never before seen an animal of the kind. This was where the party had commenced the journey up the left bank of the Murray, immedi-

ately after crossing that river." Such, Mr. Ogilby remarked, was all the information he possessed at present with regard to this singular animal; but Mr. Gould had promised to examine the original specimen on his arrival at Sydney, in the Museum of which town it had been deposited; and Mr. Ogilby therefore hoped that, through the kindness of that gentleman, he should shortly have it in his power to communicate a more detailed description of its form and characters to the Society.

Mr. Waterhouse afterwards called the attention of the Meeting to some valuable skins of *Mammalia*, brought from Africa by Capt. Alexander, recently purchased for the Society's Museum.

March 27th, 1838.

William Yarrell, Esq., in the Chair.

A Dugong preserved in spirit having been presented to the Museum by Alexander John Kerr, Esq., of Penang, Mr. Owen communicated to the meeting some notes descriptive of the principal *viscera* in this remarkable aquatic mammal, and a statement of the relative proportions exhibited by its several parts, in comparison with the dimensions of a Dugong published by Sir Stamford Raffles in the Phil. Trans., 1820, and of two other specimens which Mr. Owen had on previous occasions examined in the Society's collection.

Mr. Owen remarks, that "The external form of the Dugong is not so well calculated for moving rapidly through the water as that of the Dolphin and other carnivorous *Cetacea*, which subsist by a perpetual pursuit of living animals. In these the snout is conical, and peculiarly elongated, and in some, as the *Delphinus Gangeticus*, the jaws are produced to an extreme length, so as to give them every advantage in seizing their swift and slippery prey; whilst, in the herbivorous Dugong, the snout is as remarkable for its obtuse, truncate character;—a form, however, which is equally advantageous to it, and well adapted to its habits of browzing upon the *algæ* and *fuci* which grow upon the submarine rocks of the Indian seas.

"As, from the fixed nature of the Dugong's food, the motions of the animal during the time of feeding must relate more immediately to the necessity of coming to the surface to respire, its tail, the principal locomotive organ of ascent and descent, is proportionally greater than in the true *Cetacea*, its breadth being rather more than one-third the length of the whole body.

"But the most important external differences are seen in the presence of the *membrana nictitans*, in the anterior position of the nostrils, and in the situation of the *mammæ*, which are pectoral, or rather axillary, being situated just behind the roots of the flippers; in the female specimen examined their base was about the size of a shilling, and they projected about half an inch from the surface.

"A considerable ridge extends along the middle of the upper surface of the posterior part of the back, which is continued upon and terminates in the tail.

"The *viscera* were detached from one another, and from their natural connexions, in the same way in Mr. Kerr's as in the other specimens transmitted to the Society, so as to disable me from ascertaining their several relative positions. It may be observed, that if this were done merely with a view to their preservation, it was unnecessary; laying open the cavity of the *abdomen*, with the addition of opening the stomach and the intestinal canal in a few places,

so as to let the spirit get into the interior of the alimentary canal, would answer every purpose.

Digestive Organs.

"The mouth and tongue corresponded with the descriptions already published of these remarkable structures. The opening of the *larynx* is chiefly defended, during the submarine mastication of the vegetable matters constituting the food of the Dugong, by the extreme contraction of the faucial aperture, which resembles that of the Capybara. It is not traversed by a pyramidal *larynx*, as in the true *Cetacea*. There are two large *parotid* glands, situated immediately behind the large ascending ramus of the lower jaw. A thick layer of simple follicular glands are developed above the membrane of the palate, and a glandular stratum is situated between the mucous and muscular coats of the lower part of the *œsophagus*; a similar but more developed glandular structure is present in the *œsophagus* of the Ray.

"The stomach of this singular animal presents, as Sir Everard Home has justly observed, some of the peculiarities met with in the Whale tribe, the Peccari and *Hippopotamus*, and the Beaver: like the first, it is divided into distinct compartments; like the second and third, it has pouches superadded to and communicating with it; and, like the last, it is provided with a remarkable glandular apparatus near the *cardia*.

"These modifications obviously harmonize with the difficult digestibility and low-organized nature of the food of the Dugong. Yet, it is a fact which would not have been, *à priori*, expected, that in the carnivorous *Cetacea* the stomach is even more complicated than in the herbivorous species, and presents a closer resemblance to the ruminant stomach; it is divided, for example, into a greater number of receptacles, and has the first cavity, like the *rumen*, lined with cuticle; while in the Dugong, on the contrary, the stomach is properly divided into two parts only (of which the second much more resembles intestine), and both are lined with a mucous membrane.

"The first or cardiac cavity is of a spheroidal or full oval shape, with the left extremity, which contains the gland, produced in an obtusely conical form towards the *diaphragm*. The length of this cavity was 9 inches, its depth $6\frac{1}{2}$; but it must be remembered that it had been opened, and the sides lay flat together. In the smaller Dugong, where the stomach had probably been more distended at the time of death, this cavity measured 12 inches in length and 7 in depth.

"The *œsophagus* is very narrow and muscular, and terminates at the middle of the lesser curvature rather nearer the right than the left extremity of the cardiac cavity.

"The muscular coat of the stomach is strongly developed, but varies in thickness at different parts of the cavity. Where it covers the gland at the left extremity it is two lines in thickness, but

quickly increases, as it spreads over the wider parts of the cavity, to the extent of 8 lines; then again gradually diminishes, as it approaches the pyloric cavity, to a thickness of 1½ line at the greater curvature, but, at the constriction separating the two cavities, again increases to 6 lines: along the lesser curvature it never diminishes in thickness beyond 3 lines, the muscular coat at this part being, as in the human stomach, augmented with additional longitudinal fibres.

"In order to defend the *cardia* against the pressure of the contents of the stomach, when acted upon by this powerful muscular coat, the *œsophagus* enters the stomach in a valvular manner, and is surrounded at its termination by a vast accession of muscular fibres, forming a conical mass upwards of an inch in thickness all round the canal: the outermost of these fibres run longitudinally; the middle ones decussate each other obliquely; the innermost are circular, and form a sphincter around the *cardia*. The diameter of the canal so surrounded was 3 lines, the inner surface being gathered up in irregular transverse *rugæ*; the cellular coat is increased in thickness at its termination, and protrudes the inner membrane into the stomach like the *os tincæ* of the womb.

"The inner surface of the stomach was puckered around the *cardia*, and presented a few small, irregular *rugæ* along the lesser curvature and about the orifice leading to the second cavity, but the remainder was tolerably even and smooth. The inner membrane is a thin, soft membrane, with a finely reticulate surface. To the left of the *cardia* there projects into the stomach a rounded mammilloid eminence, whose base is 2 inches in diameter, and whose *apex* presents an oblique crescentic orifice about 3 lines in diameter; on drawing aside the margins of this orifice, I unexpectedly found that, instead of its being the outlet of a simple mass of follicular glands, as would appear from the figures and description in Sir Everard Home's Account of the Anatomy of the Dugong, it led to a wide, flattened, winding *sinus*, and that its circumference was formed by the termination of a membrane spirally disposed in about eight or ten turns, and increasing in breadth at each gyration, having both surfaces covered with the orifices of numerous glandular follicles, and the interspaces filled with a cream-like secretion. This structure, which adds another peculiarity to the stomach of the Dugong, and one met with in the *cæcum* only in a few other *mammalia*, viz. that of having its blind end occupied by a spiral membrane, I have found in all the specimens dissected at the Society; and in each case the gland was infested by *Ascarides*, hereafter to be described, which left impressions upon the spiral membrane.

"The orifice leading to the pyloric cavity of the stomach resembles in some respects a true *pylorus*; besides the additional muscular fibres, the greater part of which are circularly disposed, it is provided with a circular and valvular production of the inner membrane of the stomach of 3 lines in extent; diameter of the orifice 9 lines. Immediately beyond this valve are the orifices of the two cæcal appendages, situated 1½ inch apart at the upper and

rather towards the posterior side of the cavity; these orifices were about an inch in diameter, but the inferior orifice was the larger of the two. The appendages were of the same length, viz. 5 inches; the circumference of the anterior and superior was $5\frac{1}{2}$ inches, that of the lower one $4\frac{1}{2}$ inches; but this difference in capacity depended on the different state of dilatation in the two pouches; for on laying them open, the narrower one had its inner surface thrown into numerous small *rugæ*, while very few appeared in the wider pouch in consequence of the dilatation. Small quantities of comminuted seaweeds were found in both these receptacles.

"The muscular coat of these pouches was one line and a half thick, and arranged obliquely. There were no particular glandular appearances on the mucous coat. They seem to vary in their relative dimensions in different individuals. In the small female Dugong examined by Sir Everard Home, the posterior inferior pouch was seven inches and a half in length, while the other was only three inches, but the diameter of the latter was twice that of the longer pouch. These gastric *cæca* are interesting from repeating so closely the structure which characterizes the stomach of some of the lowest animals, in which they sometimes represent the whole of the superadded glandular apparatus of the digestive system.

"The pyloric cavity of the stomach is, as I have before observed, more like an intestine, being elongated and narrow; indeed this circumstance and the resemblance of the orifice of communication to a true *pylorus* appear to have deceived the dissectors who furnished Sir Stamford Raffles with the otherwise very accurate notes on the anatomy of the Dugong, published in the 110th vol. of Phil. Trans., 1820, since they describe these appendages as opening into the stomach near the junction of the *duodenum*; but the true commencement of that intestine is twelve inches beyond the orifices of the *sacculi*. The circumference of the pyloric cavity at its commencement was nine inches; it dilated a little beyond the orifices of the *sacculi*, and then gradually diminished to the *pylorus*, which is an orifice of about half an inch diameter. The muscular coat of this compartment of the stomach varies from two to three lines in thickness, the longitudinal fibres which run along the lesser curvature of the preceding cavity are continued on the same aspect of this one, passing between the two *sacculi*, and apparently adapted so as to close their orifices by drawing towards the *cardia* the part of the stomach that is to the right of them. The inner membrane of the pyloric cavity is similar to that of the cardiac, and is thrown into a few *rugæ*.

"Beyond the *pylorus* the mucous membrane of the intestine is for a few inches slightly rugous like that of the stomach, it is then thrown into decided transverse wavy *rugæ*; at five inches distance from the *pylorus* the *duodenum* receives the biliary and pancreatic secretions on a mammillary eminence, three lines broad. Beyond this part the transverse *rugæ* are crossed by longitudinal ones, and the inner membrane puts on a reticular appearance; this disposition continues for about six

feet, when the transverse folds gradually disappear, and the longitudinal disposition predominates through the remainder of the small intestines. The whole length of this part of the canal, in the Dugong last dissected, was twenty-seven feet; the diameter of the canal uniformly about one inch. The muscular coat throughout, two and a half lines thick, the external longitudinal layer being half a line in thickness. The cellular or nervous and mucous coats together were two lines in thickness. The orifices of the intestinal glands described by Home, (*ut sup.* p. 318,) were very distinct in the first specimen dissected, arranged in a zig-zag line—thus .·.·.·.·.·—upon the mucous membrane, along the side of the intestine next the mesentery, and occasionally crossing from one side to the other of the line of attachment; they were continued all the way to the *cæcum*.

"It would seem that this appendage was present in all the herbivorous *Cetacea*; Steller describes it as of large size, and sacculated, in the Northern Manatee (*Stellerus*). Daubenton has given a figure of the bifid *cæcum* in the Southern Manatee (*Manatus Americanus*). It is interesting to observe that a *caput-coli* is present in those of the true *Cetacea*, as the *Balænidæ*, which subsist on animal food of the lowest organized kind.

"Where the *ilium* enters the *caput-coli* in the Dugong it is surrounded by a sphincter almost as thick and strong as is that at the *cardia*. The terminal orifice is transverse and irregular.

"The *cæcum* is a conical cavity, but in neither instance was it so attenuated at the extremity as in the specimen from which Sir E. Home's representation is taken. Its length six inches; diameter at the base or entry of *ilium* four inches. The muscular coat increases rapidly in thickness towards the apex, near which it is one inch in thickness; its inner surface is smooth, and there is no appearance of glands in the mucous membrane. This circumstance, combined with its conical form, its great muscularity, and complete serous outer covering, give it a great resemblance to the left ventricle of the bullock's heart. Its capacity indeed is trifling as compared with the great development of the rest of the large intestine; and it contains no particular glandular structure; the chief peculiarity of this *cæcum* is the strength of its muscular tunic, and it might, without the simile being far-fetched, be termed, in the Dugong, the heart of the large intestines, since here its principal function is evidently to give a first powerful impulse to the motion of the long column of matter contained in the large intestines. There is no trace of a constriction at the commencement of the *colon* above the ilio-cæcal orifice; but the great intestine is continued for a little way of equal dimensions with the base of the *cæcum*, and then soon diminishes to a diameter of one inch and a half, which continues to near the termination of the canal, which becomes again wider to the *anus*. The *parietes* of the large intestines are thinner than those of the small; the muscular coat consists of a thin layer of longitudinal, and a thicker layer of circular fibres; the mucous membrane is generally smooth.

"Towards their termination the large intestines again become

wider. The inner membrane is produced into a few irregular folds, and for half an inch within the *anus* is of dark leaden colour, the *pigmentum* being apparently continued inwards for that extent.

" From the complexity of the stomach, the great extent of the alimentary canal, its vast muscular power, and glandular appendages, the digestive functions must be extremely vigorous in this animal. The vigour of the digestive functions obviously relates, in the herbivorous section of *Cetacea*, to the low organized indigestible character of their nutriment; but the complicated stomach and long intestinal canal of the carnivorous *Cetacea* must have other relations than to the kind of food. These modifications of the digestive system, for example, cannot be so explained in the *Grampus*, which preys on the highly organized *mammalia* of its own class. It is not to the nature of the food, but to the quantity of nutriment that is required to be obtained from it, that I conceive the peculiarities of the digestive system in the carnivorous *Cetacea* to relate. In no other *Carnivora* is the same quantity of blood, the same mass of fat to be eliminated from the raw material of the food: the digestive system is, therefore, perfected in these warm-blooded carnivorous *Mammalia* to meet the contingencies of their aquatic life.

" The *omentum* is continued from the great curvature both of the cardiac and pyloric divisions of the stomach; though short, it is much more distinctly developed than in the carnivorous *Cetacea*; it contains no adipose matter.

" The mesentery like the *omentum* was thin, with little fat, and a few absorbent glands of the size of French beans were scattered in it. The absorbents going to these glands were very small."

Having described various other particulars connected with the *chylopoietic viscera*, and the individual differences which they presented in the three specimens dissected, Mr. Owen proceeded to observe as follows:—

" The views taken by Cuvier of the natural affinities of the Dugong and other herbivorous *Cetacea*, as expressed in his latest classification, in which they form part of the same order as the carnivorous *Cetacea*, are undoubtedly questionable, and have been dissented from by De Blainville and other eminent authorities in zoology. If, indeed, the object of every good classification be, what Cuvier states it to be, to enable the naturalist to express in general propositions structures and attributes common to each given group, the conjunction of the Dugong with the Dolphin fails in this respect in regard to almost all the important points of internal organization.

" It is this question which may give interest to the present anatomical details, some of which are not new, and which I should not have intruded upon the notice of the Society had they previously been considered with reference to the important zoological question still at issue.

" In proceeding with our investigation of the abdominal *viscera*, we find, with respect to the biliary organs, that the Dugong deviates in a marked degree from the ordinary *Cetacea* in the presence of a

well-developed gall-bladder. Daubenton found a gall-bladder in the Manatee; but the presence of this organ is not constant in the herbivorous *Cetacea*, for in the Northern Manatee (*Stellerus borealis*, Cuv.), according to Steller*, the gall-bladder is wanting, and its absence seems to be compensated by the enormous width of the *ductus communis choledochus*, which would admit the five fingers united. The liver in the Dugong is more flattened, and more divided than in the true whales. It consists of three lobes, with a small *Spigelian lobulus* continued from the root of the left lobe. The middle of the three lobes is the smallest, and presents a quadrate figure, with its free margin projecting forwards, notched for the reception of the suspensory and round ligament, and, in one of the specimens, obtusely bifurcate; it overhangs, as it were, the gall-bladder, which is lodged in the middle of its concave or under surface. The gall-bladder was four inches in length and one inch in diameter at its *fundus*; it receives the bile in a peculiar manner; not, as in other *Mammalia*, by a junction of the cystic with the hepatic duct, with or without hepato-cystic ducts, but by two large hepato-cystic ducts exclusively, which pierce its *cervix* obliquely, just as the ureters convey the renal secretion to the urinary bladder. The orifices of the above ducts are half an inch apart, and three inches distant from the *fundus vesicæ*. The *cervix* contracts gradually into the cystic duct, which exclusively conveys the bile to the intestine. It was six inches in length, and two lines in diameter, but became dilated just before it entered the *duodenum*, and, as it passed between the coats of that gut, its lining membrane was developed into reticulate folds, presenting the only appearance of a valvular structure in the course of the duct. Three wide *venæ hepaticæ* from the left side, and one on the right side of the liver, join the inferior *cava* at the upper and posterior edge of the liver, which is not perforated by that vein.

"In the Dugong No. 2, the *pancreas*, which was situated below and behind the pyloric compartment of the stomach, was seven inches in length; thick and obtuse at the splenic or left end, where its diameter was two inches, and gradually becoming smaller towards the *duodenum*. Its secretion is carried from the component lobules by from twenty to thirty ducts, each about two lines in diameter, to a very wide common excretory canal, which terminates below, but on the same prominence, with the cystic duct; at a much greater relative distance from the *pylorus* than in the true *Cetacea*. In one of the Dugongs dissected by me I found two small accessory spleens, in addition to the larger rounded one, which measured four inches in length; but in the other specimens this alone was present.

Circulating System.

"All the three specimens presented the same remarkable extent of separation of the two ventricles of the heart which Raffles and Home have described in the individuals dissected by them, and which Rüp-

* See *Novi Commentarii Acad. Scient. Petrop. t. ii.* 1751.

pell * observed in the Dugong of the Red Sea (*Halicore tabernaculi*, R.). This condition of the heart was first noticed by Daubenton in the *fœtus* of the Manatee; and is also described by the unfortunate Steller in the genus worthily consecrated to his name, in which, however, the apical cleft of the heart extended upwards only one third of the way towards the base. In the Dugong it reaches half-way towards the base. The carnivorous *Cetacea* do not participate with the herbivorous section in this interesting structure.

"I found in each of the specimens that the *foramen ovale* was completely closed, and the *ductus arteriosus* reduced to a thick ligamentous chord, permeable for a short distance by an eye-probe from the *aorta*, where a crescentic slit still represented the original communication. In the smoothness and evenness of their exterior, and their general form, the auricles of the Dugong resemble those of the Turtle (*Chelone*): the *appendix* can hardly be said to exist in either. The right auricle is larger than the left; the *musculi pectinati* are well developed, especially in the left: they are irregularly branched, and with many of the small round *fasciculi* attached only by their two extremities to the auricular *parietes*. The free wall of the right ventricle scarcely exceeds at any part a line in thickness, and is in many places even less. The tricuspid valve is attached to three fleshy columns by *chordæ tendineæ* given off from the sides and not the extremities of the *columnæ*, both of which extremities are implanted in the walls of the ventricles. There are several other *columnæ carneæ* passing freely from one part of the ventricle to another, like the *musculi pectinati* of the auricles, and which have no connection with the tricuspid valve. The mitral valve is adjusted to its office by attachments to two short and transversely-extended *columnæ*. The thickness of the *parietes* of the left ventricle varies from half an inch to an inch. The valves at the origins of the great arteries present the usual structure. The primary branches from the arch of the *aorta* corresponded in each specimen with the description and figure by Home. There is one superior *cava* only, not two as in the elephant. The pulmonary veins terminate in the left auricle by a common trunk an inch in length.

"With respect to the vascular system of the *Cetacea*, Hunter †, speaking of the true whales, observes, "Animals of this tribe have a greater proportion of blood than any other known, and there are many arteries apparently intended as reservoirs for arterial blood;" and then he proceeds to describe the extraordinary intercostal and intravertebral plexuses in the true *Cetacea*. As no mention is made in the anatomical descriptions of the herbivorous *Cetacea*, by Daubenton, Steller, Cuvier, Raffles, and Home, respecting the existence or otherwise of similar plexuses in the several specimens examined by them, I pursued with much interest this part of the dissection of our Dugongs; but could detect no trace of this very striking modi-

* *Beschreibung des im Rothen Meere vorkommenden Dugong.* 4to. Frankfurt, 1833, p. 106.

† *Philos. Trans.* 1787, p. 415.

fication of the intercostal vessels. Here again, in enunciating a general anatomical proposition regarding Cuvier's *Cetacea*, the herbivorous species must be exceptionally cited apart.

Respiratory System.

"The peculiar form, structure, and position of the lungs have been so accurately described and figured by Raffles, Home, and Rüppel, that I have only to observe the close agreement with these accounts which the structure of the parts presented in the three Dugongs dissected by me; Daubenton* and Humboldt† describe and figure a precisely similar condition of the respiratory apparatus in the Manatee. Steller describes the same extension of the lungs along the dorsal aspect in the *Stellerus*, which he aptly compares to the position of the lungs in the bird, but without their fixation to the *parietes* of the chest, so characteristic of that class. The Chelonian reptiles, perhaps, offer a closer resemblance‡ to the herbivorous *Cetacea* in this respect; and it is worthy of remark that the air-cells of the lungs are larger in the Dugong than in any other Mammals. In the carnivorous *Cetacea* the air-cells are remarkably minute, and the lungs more compactly shaped and lodged in a shorter *thorax*.

"Existing, as both the herbivorous and carnivorous *Cetacea* do, under such peculiar circumstances,—as air-breathing animals constantly dwelling in an element the access of which to the lungs would be immediately fatal,—it might be supposed that the mechanism of the *larynx*, or entry to the air-passage, would be similarly modified in all the species, in order to meet the contingencies of their aquatic existence. But we can as little predicate a community of organization in the structure of this part as of the circulating or digestive systems in the *Cetacea* of Cuvier. The Dugong and the Dolphin present, in fact, the two extremes in the Mammiferous class, in the developement of the *epiglottis*, which is one of the chief internal characteristics of that class. In the true *Cetacea*, and the *Delphinidæ* in particular, it is remarkable for its great length, while in the Dugong it can hardly be said to exist at all. As the *larynx*, however, has only been noticed cursorily in the previous anatomical accounts of the Dugong, I beg to offer a description of this part, as it appeared in the three specimens dissected.

"The *glottis* is very small and presents the form of the letter T, the superior transverse part of the opening being, however, crescentic instead of straight, with the horns extended a little way outside of the vertical slit. This is bounded on each side by the thin convex borders of the arytenoid cartilages; the *epiglottis* makes a short obtuse pyramidal projection in front of the *glottis*; on each side of this projection there is a slightly-produced crescentic fold of the mucous

* Buffon, vol. xiii

† Wiegmann's *Archiv fur Naturgeschichte*, 1838, pl. ii. fig. 5.

‡ This resemblance is further exemplified in the shortness of the *trachea*, the completeness of its cartilaginous rings, the length of the bronchial tubes, and the extension of their cartilaginous structure far into the substance of the lungs in the Dugong.

membrane; exterior to this fold the pharyngeal membrane is puckered up into numerous minute irregular plications, in the intervals of which are the orifices of numerous mucous follicles, which are also scattered about the immediate neighbourhood of the *glottis*.

"In the largest Dugong dissected (No. 2), the *thyroid*, *cricoid*, and *arytenoid* cartilages presented several bony granulations, scattered irregularly through their substance: in older animals their ossification may become more complete.

"The mesial fissure, which is commonly present in other *Mammalia* at the inferior margin of the *thyroid*, is here continued through the whole of that cartilage, dividing it into two distinct lateral moieties, connected above by dense fibrous texture, and below by membrane merely and cellular and adipose tissue. Each portion presents an irregular elongated rhomboidal figure, of which one extremity forms the point of junction with its fellow above-mentioned, while the opposite angle is prolonged into the inferior *cornu*, and is similarly and closely connected by a strong ligament to a prominence on the side of the *cricoid* cartilage; the intermediate angle on the posterior margin of the *thyroid* feebly represents the superior *cornu*. Length of the *thyroid* cartilage, 2 inches 9 lines; breadth of each lobe, 1 inch 3 lines. The *cricoid* cartilage is the largest; it forms a complete ring. The broad posterior surface is not rounded, but bent so as to offer three facets, one narrow in the middle, which expands above and below, and two broad lateral ones; and the inferior margin describes three straight lines. The superior margin is very thick, and presents on each side an elliptical, convex, articular surface for the *arytenoid* cartilage. The anterior margin of the *cricoid* is rounded and convex, and slightly notched above. Longitudinal diameter of the *cricoid* posteriorly, 1 inch 9 lines; ditto anteriorly, 8 lines: circumference of *cricoid*, 6 inches. Each *arytenoid* cartilage is in form of a short irregular three-sided pyramid; the inner surface flat, the anterior and outer surface convex; the posterior and outer surface concave; the base is excavated, to fit the articular convexity of the *cricoid*, with which it is connected by a synovial and fibrous capsule; the *apex* is compressed and extended in the antero-posterior direction; it forms the convex lateral margin of the *glottis* above described. A short space, however, intervenes between the anterior part of the *arytenoid*, and the *thyroid* cartilages, which is occupied as usual by an elastic, dense, and pretty thick *chorda vocalis*, and the investing laryngeal membrane. There is a small pit between the anterior attachments of the *chordæ*, but no *sacculus* is developed from this or any other part of the *larynx*. The mucous membrane of the *larynx* is smooth for the extent of five lines after it is reflected over the apical margins of the *arytenoid cartilages*, and then begins suddenly to be disposed in numerous narrow *plicæ*, which increase in breadth as they descend into the *trachea*, and are arranged somewhat obliquely, diverging in a penniform manner from the middle line of the anterior surface of the tube. At the back part of the *larynx* and *trachea* these *rugæ* are longitudinal.

"The *epiglottis* cannot be said to exist as a distinct cartilage in the

Dugong; the small pyramidal prominence in front of the *glottis* is formed by a ligamentous or fibrous substance, the boundaries of which cannot be defined, as it passed insensibly into the cellular substance filling the posterior interspace of the divisions of the *thyroid*, of which cellular substance it seems to be a mere condensation. The usual muscle, called *hyo-epiglottideus*, is, however, continued from the anterior part of this *pseudo-epiglottis*. The distance from the insertion of the *chordæ vocales* to the *apex* of the *epiglottis* is 9 lines. The muscles of the *larynx* are powerfully developed. The *arytenoidei obliqui* and *transversi* are represented by a single pair of muscles, which derive a broad and extensive origin from the posterior and external ridges of the *arytenoid* cartilages, and converge to be inserted into a small round cartilage in the posterior interspace of the *arytenoids*. These muscles, through the advantage afforded to them by this middle fixed *fulcrum* (which ought therefore to be regarded as their point of origin), act with great power upon the *arytenoid* cartilages, drawing them together, and thus forcibly closing the narrow *glottis*. They are directly opposed by strongly developed *thyreo-arytenoidei*, which pass obliquely backwards from the internal and interior part of each division of the *thyroid* cartilages to the posterior and outer part of the *arytenoids*, which they draw apart, and thus open the *glottis*. The *crico-arytenoidei* arise from the anterior border of the *cricoid*, and are so inserted as to draw the *arytenoidei* forwards as well as outwards. The *crico-thyroidei* cover the whole of the fore part of the *cricoid* cartilage. The *sterno-thyroidei*, and *thyreo-hyoidei* are extremely powerful.

"The *thyroid* gland formed an irregular bilobed mass, the greater part of which lies in front of the conjoined bronchial divisions of the *trachea*. There are but three true tracheal rings anterior to the bifurcation of the air-tube: of these, the first of these is remarkable for its superior size, which forms an intermediate transition between the cricoid and the second tracheal ring. The tube is somewhat flattened from before backwards; its circumference is 5 inches; its antero-posterior diameter 1 inch. In the *Balænidæ* the tracheal rings are deficient at the anterior part of their circumference. The spiral disposition of the cartilages of the air-tubes, of which Home has given a figure, in the Dugong, is described with more detail by Steller in the Northern Manatee. It is a structure which best facilitates the lengthening and shortening of the lungs, whose change of bulk in respiration, owing to their peculiar form and position, probably takes place chiefly in that direction.

"Amongst the true *Cetacea* we have observed that it is those which subsist on the lowest organized animal substance, as the *Balænidæ*, which approach the nearest to the herbivorous species, in having the additional complexity of the *cæcum cœli*; and it is interesting to find that the same affinity is manifested in the structure of the *larynx*. The *epiglottis* and *arytenoid cartilages*, for example, are relatively shorter in the *Balænoptera* than in *Delphinus*; and, as Mr. Hunter has observed, they are connected together by the membranes of the *larynx* only at their base; and not wrapped together or surrounded

by that membrane as far as their *apices*, as in the Dolphins. In the *Balænoptera* also, the *apices* of these cartilages are not expanded, as in the Dolphins, but diminish to an obtuse extremity. These points of resemblance to the condition of the *larynx* in the Dugong and Manatee are carried still farther in the Mysticete Whale, at least in the *fœtus* dissected by me, and in which both the *epiglottis* and *arytenoid cartilages* were relatively much shorter, and the thyroid cartilage larger and more convex than in the Piked Whale (*Balænoptera*). The *thyroid cartilage* is, however, a single piece in both genera of *Balænidæ*, though deeply notched above and below; and the *larynx* presents several interesting individual peculiarities, which, however, the minute and accurate descriptions and illustrations of this organ in both the *Balænopteræ* and *Balænæ*, published by Prof. G. Sandifort*, preclude the necessity of further dwelling upon.

Uropoietic System.

"If we were acquainted with the structure of the urinary organs of the herbivorous *Cetacea* as it is exemplified in the Dugong alone, we should have to establish as marked a distinction in this respect between them and the true *Cetacea*, as in the preceding organic systems. Instead of the numerous and minute *lobuli* or *renules*, into which the kidney is subdivided in the Dolphins and Whales, it presents in the Dugong a simple, compact form, with an unbroken external surface; the *tubuli uriniferi* terminate upon two lateral series of eleven *Mammillæ*, which project into a single elongated cavity or *pelvis*, from which the *ureter* is continued. The accurate Steller†, however, describes the kidney in the Northern Manatee as being subdivided, like that of the Seal and Sea-Otter. John Hunter‡ also ascribes a similar lobulated structure to the Manatee, including it with the Seal and White Bear among the animals occasionally inhabiting the water. Daubenton§, however, in his anatomical description of the *Manatus Americanus*, merely observes: "Les reins (A. pl. lviii. fig. 6.) étoient oblongs et placés l'un vis-à-vis l'autre"; and his figure gives no indication of the lobulated structure. Home does not notice this interesting point in his Anatomy of the Manatee‖. This want of uniformity in the structure of the kidney in the herbivorous *Cetacea* is, however, of less moment with reference to their natural affinities; since in the Pachyderms we find some species, as the *Rhinoceros*, and, though in a less degree, the Elephant, presenting a subdivided kidney, while others, as the Tapir and Hog, have it entire.

Generative System.

"The generative organs being those which are most remotely related to the habits and food of an animal, I have always regarded as affording very clear indications of its true affinities. We are the

* *Nieuwe Verhandelingen der Koninklitk, Niederlandishe Instituut*, Deel. iii. p. 224, pl. I.—V.

† *Loc. cit.*

‡ On Whales, Phil. Trans., 1787, p. 412.

§ Buffon, xiii. p. 428.

‖ Phil. Trans., 1821.

least likely, in the modifications of these organs, to mistake a merely *adaptive* for an *essential* character. The true *Cetacea*, as is well known, have no trace of *vesiculæ seminales*; but I found these bags present and of large size in the male specimen of our Dugongs. These accessory secerning vesicles measured each four inches in length, and two inches in diameter at their *fundus*, where they were widest, and their glandular *parietes* thickest. The internal surface of the remainder of the cavity was reticulated. The *vasa deferentia* are short, and disposed in irregular convolutions. Each *crus penis* was attached to the lower expanded extremity of the *ischia*, which were anchylosed to the *ilia* on each side*. In the true *Cetacea* the *retractores penis* run along the sides to the under surface of the *penis*; while in the Dugong the corresponding muscles are inserted into the *dorsum penis*, as in the elephant: they meet and join in a strong tendon half way between the *crus* and the *glans penis*. In the true *Cetacea* the body of the *penis* consists of a single *corpus cavernosum*, grooved above for the passage of the *vena dorsalis*, and more deeply excavated below for the lodgement of the *urethra* and its surrounding vascular structure. But the Dugong presents a marked deviation from the cetaceous structure of the same part, which presents in a transverse section a division of the *corpus cavernosum* into two lateral portions, with a middle ligamentous *septum*, as in the Pachyderms; the vascular and erectile tissue also bears a greater proportion to the surrounding ligamentous structure than in the true *Cetacea*.

"In the Dugong the ducts of the *vesiculæ seminales* and *testes* communicate together before terminating in the *urethra*.

"Daubenton† has given a figure of the *vesiculæ seminales* in the Fœtal Manatee. Steller does not describe the parts of generation in the *Stellerus*.

"The *testes* are abdominal in the Dugong, as in the rest of the *Cetacea*; but they also have a similar position in the Elephant.

Osseous System.

"After the excellent and elaborate descriptions of the osteology of the Dugong, by Cuvier, Rüppel, and others, but little remains to be said on this subject. The bones are chiefly remarkable, as in the Manatee, for their dense texture, and the non-development of medullary cavities in them: this reptile-like condition of the skeleton is further exemplified in the loose connexion of the bones of the head. The bones are not loaded with oil, as in the *Cetacea*. All the specimens presented 7 cervical and 19 costal *vertebræ*, corresponding to the 19 pairs of ribs; but the number of the remaining *vertebræ* exceeded that ascribed to the Dugong by Home and Cuvier, there being at least 30, making in all 55. Rüppell assigns to

* The separate conditions of these rudimental pelvic bones in the Dugong is shown in Mr. Clift's figure of the Skeleton of the young Female Dugong. In the true *Cetacea* the parts analogous to the *ischia* are alone present: they serve a similar purpose to that in the Dugong.

† *Loc. cit.*, pl. lviii. fig. 6.

the *Halicore Tabernaculi*, 7 cervical, 19 dorsal, 3 lumbar, 3 pelvic, and 27 caudal *vertebræ*; in all 59 *vertebræ*. I found, as he also describes, that the first four pairs of ribs reached the *sternum*, through the medium of cartilages; all the others terminated freely in the mass of abdominal muscles: the 10th to the 15th are the longest, the last is the shortest. The affinity of the Dugong to the *Pachydermata* is thus again illustrated by the great number of the ribs. The lower jaw is articulated to the *cranium* by a true synovial capsule, reflected over cartilaginous surfaces, and not, as in the carnivorous *Cetacea*, by a coarse and oily ligamentous substance.

Dentition.

"My attention was particularly directed to the state of the dentition in the Dugongs of different sexes, which I have thus had the good fortune to examine; from which it would appear that, as in the Narwhal, the permanent tusks of the female are arrested in their growth, and remain throughout life concealed within the substance of the intermaxillary bones and the alveolar integument. The cavity of the tusk is in like manner filled up by the secretion of the pulp which retrogrades in the course of its absorption, and hence the tusks are solid, like the corresponding tusks in the female Narwhal, or at least present only a shallow cavity at their expanded and distorted base. The form of the tusk from this part is irregularly cylindrical, and it diminishes to an obtuse point at the opposite or lower extremity, which is perceptible only in the dry skull.

"It is remarkable that in all cases the external *parietes* of the *alveolus* of the abortive tusk is wanting opposite its base, and this occurs even in the young female Dugong, when the base of the permanent tusk is near the lower extremity of the deflected portion of the intermaxillary bone; but as the pulp and the base of the tooth ascend, (or rather appear to ascend, in consequence of the elongation of the bone and the teeth,) the vacuity also ascends, and is situated in the adult at the upper part of the external surface of the deflected portion of the intermaxillary bone*. In the male the permanent tusks project beyond the jaws, and manifest, by the deep conical cavity at their base, the persistence of the formative pulp and their continual growth and renovation. These tusks also differ from those of the female, in not being expanded at their bases, but continuing of uniform diameter from one end to the other; the projecting extremities of the tusks are bevelled off from within, outwards and downwards, and terminate in a sharp chisel-edge. Only a very small portion of the tusk projects from the jaw, (in which circumstance the Narwhal differs most widely from the Dugong,) at least seven-eighths of the tusk are imbedded in its socket, and the socket is entire throughout its whole extent, the exterior of the intermaxillary bones generally presenting an unbroken surface, which,

* The skull of the female Dugong figured by Rüppell (*loc. cit.*) exhibits this characteristic vacuity in the *parietes* of the socket of the tusk. The contained teeth were cylindrical and conical.

independently of the projecting tusks, unerringly characterizes the skull of the male Dugong.

"It has been suggested that the use of the projecting tusks in the Dugong is to detach *fuci* from the rocks to which they adhere: one can hardly, however, assign any important function in relation to nutrition to parts which are limited to the male sex; but it must be remembered that the function was assigned by a physiologist who supposed that the tusks in question were specific and not sexual characters, and that the imperfect tusks, which are peculiar to the female, were the predecessors of the projecting tusks, and, in fact, deciduous teeth. This opinion of Sir Everard Home was first called in question by Dr. Knox*, who, having detected the supposed deciduous tusks in the head of a nearly full-grown Dugong, rejected with great justice the opinion of Home, that they are deciduous teeth; and he truly observes, that no evidence had been given to prove the existence of deciduous tusks at all in the Dugong†.

"I need hardly observe that the tusks of the Dugong, being implanted in the intermaxillary bones, are to be regarded, like the tusks of the Elephant, as incisors. Now both sexes of the Dugong, as of the Elephant, do, in fact, possess deciduous or milk-tusks, but they are much smaller than the female permanent tusks or supposed deciduous teeth of Home.

"In a recent *cranium* of a male Dugong, sent to the Zoological Society in spirits, I found in the upper jaw the deciduous incisors or tusks coexisting with the permanent ones. They were loosely lodged, by one extremity, in conical sockets immediately anterior to those of the permanent tusks, and adhered by their opposite ends to the integument, which externally presented no protuberance or other indication of them. They were two inches in length, slightly curved, subcylindrical, tapering to both extremities, the fang-end being the smallest, and perforated by an aperture leading to the extremely contracted cavity in which the remnant of the exhausted *matrix* was lodged. From a comparison of the jaws of the dissected specimens, and several *crania* of different ages, it appears that not more than 20 grinders are developed in the Dugong, viz. 5 on each side of each jaw. Of these the first is shed before the last or fifth comes into use. In the dry skull I have seen the last molar projecting from its socket, before either the deciduous incisor or the first molar had been shed, but its crown presented the primitive tuberculate *apex*, and had not penetrated the gum. The *molares* increase very regularly in size from the first to the last. The fang of the first and second is soon completed and solidified by the progressive absorption of the pulp: that of the third retains for a longer period its pulp and expanded conical cavity, but it becomes at length contracted to a point, and is pushed out; the fourth and fifth *mo-*

* Edinb. Phil. Trans. xi. p. 389.

† "The milk-tusks of the Dugong have never been seen by any one; that is, I have not heard of the existence of any preparation showing the germs of the milk or permanent teeth, together or in succession."—*Dr. Knox, loc. cit.* p. 398.

lares, which may be regarded as the permanent teeth, retain through the greater period of life the wide conical cavity for their pulp, thus resembling the grinders of the *Edentata*: the pulp of the last molar becomes, in the progress of its development, extended in the antero-posterior direction, and contracted transversely in the middle, so as to give a sub-bilobed form to the mature grinder. Thus the molar teeth of the Dugong succeed each other, as in the Elephant and true *Cetacea*, in the horizontal, not in the vertical direction. The first deciduous *molares* are shed before the deciduous incisors. They are always much eaten away by the absorbents, especially about the neck.

"In the skull of a male Dugong which had *molares* $\frac{3-3}{2-2}$, the sockets of the deciduous incisors were obliterated, and the points of the permanent ones projected from their sockets.

"In only one out of seven *crania* of the Dugong which I have examined, have I found incisors in the lower jaw; they were two in number, one in the corresponding socket of each *ramus*, which sockets were much deeper than the rest. These teeth were smaller and more bent than the deciduous incisors of the upper jaw. They are obviously analogous to the rudimental teeth which have been described in the jaws of the fœtal Whale. The Dugong in which these were found was eight feet in length; the remaining six toothless *alveoli* in the anterior part of the lower jaw were also present, though much shallower than those containing the teeth. In the other recent heads examined by me, the *alveoli* in the deflected portion of the lower jaw contained ligamentous processes given off from the internal surface of the thick callous integument covering that part of the jaw: they serve the purpose of fixing more firmly to the bone this dense and almost horny plate, which is beset externally with short coarse bristles, and is doubtless used in scraping and tearing off the sea-weeds and other alimentary substances which may be fixed to the rocks.

"It is obvious that the different form and condition of the tusks thus observed in the heads of Dugongs of the same size and age, might be regarded as indicating a specific instead of a sexual difference. Dr. Knox inclines to the former opinion*; I have however adopted the latter view, not hastily or hypothetically, but as the result of a minute comparison of the forms and proportions of all the crania which have come under my observation, and of which I have embodied the principal results in the subjoined table.

* This able comparative anatomist observes, "The tusks differ as much in form in the two crania, as the tusks of the Asiatic Elephant differ from those of the African one, and therefore naturalists would say, that these animals must be specifically different." I hesitate, however, in asserting this positively, and would rather say that it amounts with other data, such as the belief, on the part of the Malays, in whose seas these animals reside, that, to a great probability, there are two distinct species of Dugong now inhabiting the Eastern Ocean.—*loc. cit.* p. 395.

	Male.* Molares $\frac{5-5}{5-4}$		Female.† Molares $\frac{2-3}{3-3}$		Male,‡ Molares $\frac{2-2}{2-2}$	
Cranium.	in.	lin.	in.	lin.	in.	lin.
Length of the *cranium*	13	11	14	8	14	6
From the occipital crest to the upper border of the nasal aperture	4	10	5	0	5	0
Length of nasal aperture	4	0	5§	0	5	0
Breadth of ditto.	2	6	2	9	3	0
From the lower border of the nasal aperture to the end of the intermaxillary bone	7	4	7	7	8	8‖
Breadth of *occiput*	5	0	5	4	5	10
Smallest interspace of the temporal ridges	2	5	2	3	2	2¶
Greatest distance between zygomatic arches	7	3	7	10	8	4
Greatest distance between postorbital processes of the frontal bone	5	7	6	0	6	4
Lower Jaw.						
From the condyle to the lower part of the *symphysis*	9	7	10	6	11	3
From the condyle to the base of the ascending *ramus*	6	0	6	6	6	6
Breadth of ascending *ramus*	2	10	2	10	3	0
Length of dental (molar) series	2	0	2	0	2**	0
Length of sloping *symphysis*	4	6	5	0	5	2
Breadth of ditto.	2	2	2	6	2	3
From outside of one condyle to that of the other	6	3	6	6	7	0
From the condyloid to the coronoid process	2	2	2	7	2	7

"The short and thick neck, fin-like fore-legs, want of hind-legs, caudal tegumentary fin, smooth, naked, and almost hairless integument, are all modifications of external form, by which the Dugongs and Manatees are adapted to play their part in the waters: but the *kind of part* which they are to play in that element depends on organic characters which mainly if not exclusively reveal their true affinities. Now we have seen that the whole of the internal structure in the herbivorous *Cetacea* differs as widely from that of the carnivorous *Cetacea*, as do their habits: that the amount of variation is as great as well could be in animals of the same class, exist-

* Deciduous and permanent tusks in place; the first molar, left side, lower jaw shed. Outer wall of sockets of permanent tusks entire.

† Deciduous tusks shed and their sockets obliterated; the points of the permanent tusks protruding from their sockets: the shallow cavity at their base exposed by the absorption of the wall of the socket at that part.

‡ Sockets of deciduous tusks obliterated, permanent ones protruded to the usual extent and worn by use: their sockets entire.

§ This dimension increases as the intermaxillary bones are lengthened in the antero-posterior direction.

‖ The increase of this dimension is due to the greater development of the lower part of the intermaxillary bones in correspondence with the sexual condition of the tusk.

¶ This dimension of course diminishes with the increased development of the temporal muscles consequent upon the fitness of the tusk for use.

** The increasing breadth of the last molar compensates for the loss of the small anterior molars.

ing in the same great deep. The junction of the Dugongs and Manatees with the true Whales cannot therefore be admitted in a distribution of animals according to their organization. With much superficial resemblance they have little real or organic resemblance to the Walrus, which exhibits an extreme modification of the amphibious carnivorous type. I conclude, therefore, that the Dugong and its congeners must either form a group apart, or be joined, as in the classification of M. De Blainville, with the Pachyderms, with which the herbivorous *Cetacea* have the nearest affinities, and to which they seem to have been more immediately linked by the now lost genus *Deinotherium*."

Admeasurements.	Raffles.		Zool. Soc. No. 1. 1831.		Zool. Soc. Female. No. 2. 1831.		Zool. Soc. Male. No. 3. 1838.	
No	ft.	in.	ft.	in.	ft.	in.	ft.	in.
1. Total length of the animal	8	6	6	3	7	1	6	10½
2. Greatest circumference	6	0			4	8		
3. Length of head from nostrils to occiput	1	3			1	1		
4. Length of head from nostrils to end of snout	0	3½			0	5	0	3½
5. Width of snout	0	9½			0	8		
6. Depth of snout	0	1½			0	5		
7 Length of chin	0	5			0	4		
8. Breadth of chin	0	5½			0	4½		
9. Distance from nostrils to the eyes	0	6½			0	5½		
10. Distance from eyes to ears	0	6½			0	5½		
11. Distance from eyes to flipper.	1	5½			0	11½	10	0
12. Length of the flippers	1	1			1	1		
13. Breadth of flippers	0	8			0	6		
14. Breadth across belly from fin to fin	1	11			1	2		
15. Distance between the *mammæ*	1	5			1	1		
16. Breadth of tail from tip to tip	2	7			2	8	2	6
17. Circumference of root of tail	1	9			1	5		
18. Distance from *anus* to centre of tail	2	9			2	1		
19. Distance from *anus* to *penis*	1	2			0	11		
20. Total length of intestines	115	0	66	0	101	0		
21. Total length of small with *cæcum*	14	0	20	6	37	0	27	6
22. Total length of large	72	0	16	0	64	8	50	0
23. Total length of large with *cæcum*					65	2		
24. From end of snout to flipper	2	0			1	6		
25. Circumference of neck					2	9	2	7
26. Diameter of orifice of eye-lids					0	0½		

Some prepared specimens belonging to the genera *Siphunculus* and *Asterias*, collected by Mr. Harvey upon the Devonshire coast, and presented to the Society, were upon the table, to which Mr. Owen drew the attention of the Meeting. The Chairman read an extract of a letter from the former gentleman, in which he stated that a considerable number of the Red-band Fish (*Cepola rubescens*) had been picked up on the beach near Teignmouth. One of these specimens sent by Mr. Harvey was exhibited by Mr. Yarrell, who observed

that these fish are rarely captured, owing to their keeping very near the bottom, and their shape allowing them to pass through the meshes of the fishermen's nets. In severe storms, however, shoals of this *Cepola* are sometimes killed by being driven against the bottom, or dashed against the rocks, and are then thrown on shore dead. Mr. Yarrell remarked that he had heard of two or three instances of this kind recently occurring on the British coast.

April 10, 1838.

Rev. John Barlow in the Chair.

The first communication laid before the meeting was a description by Mr. Owen of the organs of deglutition in the Giraffe, being a supplementary note to his former memoir on the anatomy of that animal.

Mr. Owen observes that since the Giraffes have been at the Gardens, they have not been known to utter vocal sounds, except once, at the time of coition, when the male uttered a cry like that of the Deer; and the incapacity of the species in this respect would seem to be indicated by the structure of the *glottis*, the *rima* of which is permanently open for the space of a line, so that the chords cannot be brought into mutual apposition.

The modifications of the organs of deglutition accompanying this open condition of the fissure leading into the windpipe are very remarkable, and unlike any of the few deviations from the ordinary structures of the *fauces* and *glottis* hitherto noticed by anatomists in other animals (as in the Elephant, Camels, *Cetacea* and certain *Rodentia*, &c.).

On looking down the mouth into the *fauces* the cavity appears to be as completely closed as in the *Capibara*; but instead of narrowing in an infundibular form to a small circular depression, it is terminated by a transverse slit through which projects a soft, rounded, valvular ridge, formed by the broad superior margin of the *epiglottis*, which is folded down upon itself at that part. The surface of the *fauces* is broken by large risings and depressions, or is coarsely corrugated.

On looking at the *velum palati* from behind, it is seen to descend to the margins of the *glottis* in the interspace between the *epiglottis* and the large arytenoid cartilages; and on raising the soft palate, a small process, or rudimental *uvula*, is seen, continued from the middle of its inferior margin into the open laryngeal fissure; but it only fits into the posterior part of this open fissure; the anterior part is defended by two processes of the mucous membrane of the *larynx* which are continued from the angle between the *epiglottis* and *glottis*. These processes are thick, of a triangular form, with their *apices* turned backwards and inwards, so as to cover and close the anterior part of the *glottis*: when the soft palate is raised to bring them into view they seem like two accessory *epiglottides*; but they consist merely of a duplicature of mucous membrane.

At the posterior part of the soft palate there is an oval glandular body about one inch in long diameter.

The tonsils are well-developed glands communicating with the *fauces* by a single wide opening, or *fossa*, and thus exhibiting a

higher type of structure than they present in the human subject, where the mucous follicles terminate by several separate apertures. They are two inches in length and one in breadth.

Mr. Owen then proceeded to read the first part of a paper on the Anatomy of the *Apteryx*; the body of that bird having recently been presented to the Society's Museum by the Earl of Derby. The results of the anatomical examination, communicated to the Meeting on this occasion, embrace a detailed description of the parts connected with the digestive apparatus.

Commencing with the beak, Mr. Owen notices the general superficial resemblance which it bears to that of the Curlew and *Ibis*, though it differs essentially from this organ in the slender-billed waders, by having the perforations of the nostrils near the *apex*, and the base covered with a *cere*. The *cere* terminates anteriorly in a concave or lunated curve, resembling that of the *Rhea*. Two narrow grooves extend from the angles or cresses of the *cere* along each side of the mandible, the upper groove being continued to the truncated extremity of the mandible, the lower one leading into the external nostril, which forms, as it were, the dilated termination of the groove, and this occupies a position of which there is no other known example throughout the class of birds.

The *cere* was about an inch in length, furnished at its sides with short stiff plumes and hairs, while at its base a number of long black bristles are given off, the presence of which, in conjunction with the extension of sensitive skin upon the beak, is considered by Mr. Owen to indicate the importance of the sense of touch to the *Apteryx*, and to correspond with the account given of its nocturnal habits. The general form of the beak is adapted for insertion into crevices and holes, in search of insects, which were found to constitute in part the contents of the gizzard.

The tongue, as in all the struthious birds, was short and simple, yet presented nevertheless a greater relative development. It was of a compressed, narrow, elongated, triangular form, with the *apex* truncate and slightly notched; the lateral and posterior margins entire: 8 lines in length, 4 lines broad at the base, 1 line across the *apex*. The anterior half consisted of a simple plate of a white, semitransparent, horny substance, gently concave above; behind this the exterior covering, which is lost in, or blended with, the horny plate, gradually becomes distinct, and assumes the character of a mucous membrane: it was reflected over the posterior margin of the tongue, forming a crescentic fold, with the concavity towards the *glottis*; but here, as well as on every other part of the tongue, it was devoid of spines or *papillæ*. The lining membrane of the *pharynx*, behind the *glottis*, formed two elongate, square-shaped, smooth, thick, and apparently glandular folds or processes, the obtuse free margins of which project backwards, like lappels, into the *pharynx*; beyond which the lining membrane is produced into close-set, narrow, somewhat wavy, longitudinal folds.

The *œsophagus* at its upper extremity was half an inch in diameter,

but rapidly diminished to a breadth of three lines, of which size it continued to the commencement of the *proventriculus*; its position was to the right of the cervical *vertebræ*, and a little behind and to the right of the *trachea*, to which latter it was closely connected.

The muscular coat of the *œsophagus* was about half a line in thickness, and its fibres were arranged in two layers; in the internal layer the fibres presented a longitudinal arrangement, while in the external their disposition was circular. The length of the tube was about eight inches, and its dilatibility was indicated by the lining membrane being disposed in narrow longitudinal *rugæ*.

The *proventriculus* was one inch two lines in length and half an inch in diameter, and situated in the *axis* of the *œsophagus*, of which it formed an immediate continuation: the gastric glands were developed around its entire circumference, their orifices opening in the meshes of a reticulated surface, produced by the longitudinal *rugæ* of the œsophageal membrane, changing their character after entering the *proventriculus*, and branching, as it were, over its surface.

The stomach was small, measuring less than two inches both in its longitudinal and transverse diameters: in shape it had more the character of a membranous stomach than of a gizzard, being of a regular oval-rounded form. The muscular fibres were not arranged in the definite masses called *digastrici* and *laterales*, but radiated from two tendinous centres of about two-thirds of an inch in the longest diameter. Upon the inner surface of the gizzard were two protuberances, one at the lower and one at the upper end of the posterior part. The situation of the latter was such with respect to the cardiac and pyloric openings, that Mr. Owen conceives it would tend to close these openings during the forcible contraction of the fibres at the upper part of the gizzard, and thus probably in some measure regulate the passage of food into this cavity, by retaining a portion in the *proventriculus*, until the gizzard should have become emptied of its previous contents.

A narrow pyloric passage of about three lines in length extended from the upper extremity of the gizzard into the *duodenum*; there was no sphincter present, and no pyloric pouch, as in the Ostrich, but the cuticle was continued into the *duodenum* about three lines beyond the *pylorus*.

Upon removing the abdominal muscles, the two lobes of the liver were seen to occupy the anterior part of the cavity, extending from above the notches of the *sternum*, to midway between the *sternum* and the *cloaca*.

The stomach was entirely concealed by a large omental adipose process, continued from that of the *peritoneum*, and upon the longitudinal division of which so much of the stomach was exposed as projected between the lobes of the liver; its position was towards the left side of the *abdomen*.

The space below the stomach and liver was occupied by long and simple loops of intestine, extending obliquely and nearly parallel with each other from the upper and right to the lower and left side

of the *abdomen*. The lowest and largest superficial loop was formed by the *duodenum*, and the whole were hid by an omental covering thickly charged with fat.

The interspace of the *duodenum* was occupied by the two lobes of a narrow and elongated *pancreas*, the pointed extremity of the anterior lobe extending freely beyond the bend of the *duodenum*, and immediately beneath it appeared the end of the *rectum* and *cloaca*.

Upon dissecting away the omental processes and raising the exposed loops of intestine, the *rectum* was seen extending forwards about two inches along the mesial line, and then receiving the *ilium* and extremities of two *cæca*: the anterior half only of the *rectum* had an investment of *peritoneum*.

Upon raising the liver, and drawing aside the stomach, the duodenal loop was seen extending in a curved direction, and about four inches in length, from the right side of the gizzard as before noticed, having formed that loop, the intestine bends abruptly backwards, upon itself to the right, and then forms a second loop three and a half inches long, which is continued down the right side of the *abdomen*. Three similar but somewhat shorter loops are there formed to the left of the preceding, after which the intestine returns to near the commencement of the *duodenum* behind the stomach, and close to the root of the mesentery, whence it descends to form a fifth long loop situated at the left side of the *abdomen* behind the others, and then becoming looser terminates after a short convolution in the *rectum*.

The *cæca* were each five inches in length, and attached throughout their whole extent to different parts of the last folds of the *ilium*.

The small intestines had a general diameter of three lines, their size slightly diminishing on approaching the *rectum*. The *cæca* at their commencement rather exceeded in diameter that of the *ilium*, their capacity slightly increasing to near their blind extremities, where, having attained the diameter of about five lines, they suddenly taper to an obtuse point. The anterior half of the *rectum* was contracted and the lining membrane thrown into longitudinal folds, but these gradually subsided in the second or dilated portion. The *rectum* communicated with the urinary dilatation by a small semilunar aperture, from which several short *rugæ* radiated. This compartment of the *cloaca* was not expanded into a large receptacle as in the Ostrich, but offered the same proportional size as in the Emeu, measuring about two-thirds of an inch in length and the same in diameter. The external compartment of the *cloaca* contained a large single *penis* retracted spirally, and one inch and a half in length when extended. It was traversed by an urethral groove, the sides of which were not beset with *papillæ* as in the Gander, but simply wrinkled transversely. At the back part of the *cloaca* there was a small *bursa* half an inch in length, and communicating by a wide longitudinal aperture with the external compartment.

The gizzard contained a greenish yellow pulpy substance, and numerous filamentary bodies, amongst which a few slender legs of

insects and portions of the down of the *Apteryx* were the only recognizable organized parts; it also contained a few pebbles.

In the small intestines a little pulpy material was present, similar to that in the gizzard, but of a darker colour.

The *cæca* contained a larger quantity of similar, but more fluid matter, in which the legs of insects were again discernible.

The liver consisted of two large lobes, connected by a narrow isthmus, the right being the larger and of a subtriangular figure; the left was more quadrangular in shape.

The gall bladder, one inch and a half in length, was appended by its *cervix* to the inner margin of the right lobe of the liver, the medium of attachment being formed by the nutrient vessels of the gall-bladder, and by two short cyst-hepatic ducts, with a reflection of serous membrane upon them. A cystic duct was continued in length rather more than two inches, to half way between the lower bend of the termination of the *duodenum*.

The hepatic duct terminated a few lines below the cystic; both ducts were larger than usual.

The *pancreas* consisted as usual of two elongated subtriedral lobes, lodged chiefly in the anterior part of the duodenal interspace; one of the lobes extended upwards to the right as far as the spleen. The secretion was carried by two short and thick ducts, which terminated close to the hepatic and cystic upon a small longitudinal ridge.

The spleen presented no peculiarities; its size was about that of a hazel-nut.

With respect to the physiological relations of the apparatus just described, Mr. Owen remarks that the whole is harmoniously co-adapted to the instruments of prehension which characterize the *Apteryx*.

A beak framed to seize and transmit to the gullet small objects, is succeeded by a simple and narrow muscular canal. The food being of an animal nature, and taken in small and successive quantities, is digested as fast as it is obtained, and therefore the *œsophagus* is not required to be modified to serve as a reservoir, either by its extreme width, or a partial dilatation. The *proventriculus*, in the comparative simplicity of its glands, and the gizzard, in its small size and medium strength, more forcibly bespeak structures adapted for the bruising and chymification of animal substances presenting, as do worms and the softer orders of insects, a moderate resistance.

The length of the intestines, which somewhat exceeds that of the slender-billed insectivorous waders, and the size of the *cæca*, are considered by Mr. Owen to indicate an intention, that this bird, which is so remarkably restricted in its locomotive powers, should have every needful or practicable advantage in extracting from its low-organized animal diet, all the nutriment that it can yield.

April 24th.

R. C. Griffith, Esq., in the Chair.

Some notes by Mr. Martin were read, On the visceral anatomy of the Spotted Cavy, *Cœlogenus subniger*, taken from the examination of a male specimen which had died suddenly in the Menagerie of the Society. The length of the head and body along the spine measured about 1 foot 10 inches.

On opening the *abdomen*, the large folds of the *cæcum* presented themselves, occupying the whole of the umbilical and epigastric regions, while to the left appeared the coils of small intestine; and a portion of the stomach was seen to emerge from below the edge of the left portion of the liver. The *omentum* was of very small extent, destitute of fat, and crumpled up beneath the stomach.

The *duodenum* commenced in the form of a large pear-shaped sac, which measured in length $2\frac{3}{4}$ inches, when the intestine assumed its ordinary size, namely about half an inch in diameter. The dimension of the sac at its largest part was four inches in circumference. This pyriform commencement of the *duodenum* obtains in many Rodents, and also in some *Insectivora*; among the former may be noticed the *Coypus*, *Capromys*, and *Anœma*: in the insectivorous animal lately described (Zool. Proc. 1838, p. 17.) under the name of *Echinops Telfairi*, the same structure also is remarkable. The course of the *duodenum* was as follows: leaving the *pylorus* and loosely attached by mesentery, it described an arch over the right kidney, whence it passed over the spine to the left kidney; it then turned back to the spine, and there making several abrupt convolutions merged into the *jejunum*. In the sacculated part two *areolæ* of glandular follicles were apparent through the *parietes*. As in the Agouti, (Zool. Proc. 1834, p. 82.) the stomach had a constriction between its cardiac and pyloric portion; in which point (as does the Agouti,) it differs from the Acouchi, the dissection of which will be found in the Proc. of Com. of Sci. &c., 1831, p. 75. The length of the stomach lying on the table undistended, or but slightly, was 6 inches; the cardiac portions swelled out to the extent of nearly 2 inches beyond the entrance of the *œsophagus*, and its pyloric extremity swelled out into a process on each side, as in the Agouti. A muscular band, commencing at the entrance of the *œsophagus*, passed longitudinally along the stomach, contracting the greater curve into *sacculi*, especially at the constricted portion. The length of the *œsophagus* within the abdomen was one inch and a quarter.

The length of the small intestines was very great, the measurement being 21 feet 8 inches.

The *cæcum* was large, *irregularly*, *multitudinously*, but *not deeply* sacculated; in form it was gently conical, terminating in a subacute

apex; its length 2 feet 4 inches, its basal circumference about 7 inches. When blown up it formed a spiral turn and a half. The large intestines at their commencement were about 7 inches in circumference, the decrease being gradual. The lining membrane of the *colon* formed a series of regular longitudinal *striæ*, gradually disappearing as the intestine narrowed, until at length they finally disappeared. The *colon* in its course followed the circular sweep of the *cæcum* to which it was attached by a riband of mesentery $1\frac{1}{2}$ inch in breadth.

At about two feet from its origin the *colon* merges into a flat layer of circular folds, the intestine making four distinct gyrations; from this part to the *anus* the intestine measured 9 feet 3 inches.

The circular fold above noticed is analogous to the long loose fold observed in the same parts of the intestine in other *Rodentia*, as the *Coypus*, and *Capromys*, and which is noticed in the respective accounts of the dissection of those animals in the Zoological Proceedings.

At a little distance above these circular folds, and throughout the remainder of the intestinal canal, the *fæces* assumed a knotted character.

The liver formed a right and left portion; the *right portion* was divided into two parts, of which the innermost was the smallest; the *left portion* was divided into four nearly equal *lobuli*; between the first and second of which (reckoning from the centre) projected the gall bladder, very large, and distended with bile of a dark green colour; its shape was oval, being $2\frac{1}{2}$ inches long, but it was evidently *over-distended*. On turning up the liver a large hepatic duct was seen running from its base, for the length of an inch, to join the cystic duct, nearly 2 inches from the origin of the latter; the common duct thus formed was $1\frac{1}{4}$ inch in length, and terminated at the neck of the duodenal sac $2\frac{3}{4}$ inches from the pyloric orifice.

The spleen of a prismatic figure, $2\frac{1}{4}$ inches long, was somewhat closely adherent to the *cardium*; its colour was dark. Spreading in the mesenteric membrane below the stomach, and between this, the spleen, and the duodenal fold, lay the *pancreas*, a large foliaceous gland of an irregular figure.

The *vena portæ* was large and gorged with blood.

The kidneys were nearly in a parallel line with each other; their figure was elongated, (being 3 inches in length by one in breadth at the middle,) and at their upper *apex*, internally, lay the renal capsules, long cylindrical bodies, of an ochreous colour, and extending to the emulgent vessels.

The right kidney lay much closer to the *vena portæ* than did the left; the *vena portæ* in fact passed over the renal capsule on the right side, while the upper *apex* of the kidney was in contact with it. The length of the renal capsules was $1\frac{1}{2}$ inch, their figure vermiform.

There was no marked line of division between the cortical and medullary substances of the kidney. The urinary *tubuli* converged into three obtuse *papillæ*; the *pelvis* was very small.

The lungs consisted of three right and two left lobes. The heart was round, and firm in texture, the left ventricle being very stout; the *apex* exhibited a slight tendency to a bifid figure. The *aorta* at its arch sent off *first* an *arteria innominata*, which divided into a right subclavian, and a right and a left carotid; then *secondly*, at a quarter of an inch further, *a left subclavian*, in an undivided condition.

The thyroid glands were very small.

The tongue was $3\frac{1}{2}$ inches long, fleshy, rounded at the tip; the upper surface villose, with fine close hairy *papillæ*; at its base were numerous, large, mucous follicles.

The *pharynx* was funnel-shaped and prolonged; the œsophagial orifice being at the root of the *epiglottis*, and about large enough to admit a common black lead pencil. The *œsophagus* was longitudinally corrugated internally.

The *epiglottis* was deeply notched, and with patulous and slightly curled edges.

The arytenoid cartilages were prolonged.

The upper corner of the *os hyoides* consisted of three portions.

The sublingual glands were about the size of a nutmeg, or scarcely so large; the rings of the *trachea* (of course imperfect,) amounted to 33.

The clavicles were imperfect, $1\frac{3}{8}$ inch in length, and united to the *sternum* by a cartilaginous continuation nearly an inch long.

The generative organs agreed closely with those of the Acouchi. The *epididymis* appeared externally through the abdominal ring, enveloped in a *cremaster*, to which both the internal oblique and the transversalis muscles appeared to contribute. The *penis* was retroverted at the *pubes*, and before the skin of the body was taken off, was invisible, being completely retracted within the preputial fold. At the angle which it makes on the *pubes*, where it is retroverted, there is spread a slip of fibres from the external oblique.

The length of the *penis*, from the *pubes* to the extremity of the *glans*, was $2\frac{1}{2}$ inches; the extreme portion for $1\frac{1}{4}$ inch enclosed an osseous stylet. The *apex* of the *glans* and its subsequent portion for an inch on the under surface were covered with close-set minute horny *papillæ* directed backwards; and along the *dorsum* was a double row of retroverted sharp horny points, each point decreasing from the first to the last; the number in each row being five. Its extremity was bifid, the orifice entering into a cavity, whence anteriorly issued the *urethra*, which, posteriorly, was continued into a rugous canal of considerable depth, having at the bottom two pointed osseous spurs, which are capable of being protruded.

The length of the *penis*, from the *apex* of the *glans* to the bulb, was four inches. The length of the membranous part, two inches.

The *testes* lay within the abdominal ring; they were oval in form, and $1\frac{1}{2}$ inch long. The *epididymis*, on laying open the muscular sac, was seen to consist of an assemblage of contorted tubes, from which emerged the *vas deferens*; the length of this, to its entrance at the base of the *vesiculæ seminales*, being $5\frac{1}{2}$ inches. The *vesiculæ semi-*

nales were large, and foliated at their upper part; their length was $2\frac{3}{4}$ inches.

The morbid appearances were as follows:

The vessels of the brain gorged with blood, and deep blush occupied the whole surface. The abdominal *viscera* were adherent to each other and to the peritoneal lining of the *abdomen*. The bladder was distended with urine, so as to be as thin as fine transparent paper; it extended above the *umbilicus*, and was adherent to the *peritoneum*. The urine exuded through its *parietes*, as the moisture with which it was perpetually bedewed proved by the smell. There was bloody fluid in the *abdomen*; and the gall-bladder was distended as large as an egg.

Mr. Waterhouse exhibited a new species, from the Society's Collection, of *Gerbillus*, and a new *Herpestes*, which were accompanied with the following descriptions.

HERPESTES FUSCA. *Herp. fusca; pilis nigro flavoque annulatis, ad basin fuscescentibus; gulâ fusco-flavâ; caudâ, quoad longitudinem, corpus ferè æquante, pilis longissimis obsitâ.*

	unc.	lin.
Longitudo *capitis corporisque*	18	0
——— *caudæ*	17	0
——— *tarsi digitorumque*	3	6

Hab. India (Madras?)

"This species is about equal in size to the *Herpestes major* or *urinatrix* of the Cape, and hence is larger than any of the Indian species hitherto described. It approaches in colour nearest to *Herp. brachiurus* of Mr. Gray, but may be distinguished by its very long and bushy tail. The claws of the fore feet are remarkably large and of a brown colour; the longest claw measures upwards of three quarters of an inch; the feet are blackish. Each hair of the back is grayish brown at the base, then pale brown, and the apical half is black, generally with about three or four yellowish rings. At a little distance the animal appears to be of a deep brown colour.

"The skins from which the above description was taken were purchased at a sale of zoological subjects, the greater portion of which were from Madras. As, however, there were some from the Nilgherries, it is possible these specimens may have come from that quarter. The dimensions of a skull, accompanying one of these specimens, are as follows:—

	inch.	lin.
Total length of skull	3	6
Width of skull	2	0
Length of palate.....	1	$9\frac{1}{2}$
Width of palate between posterior molars ..	0	$7\frac{1}{2}$
Width of ditto between canines	0	$5\frac{1}{2}$
Length from incisors to hinder portion of last molar	1	$4\frac{3}{4}$

GERBILLUS CUVIERI. *Gerb. suprà colore flavescenti-cinnamomeo; gulâ, abdomine, pedibusque niveis; auribus mediocribus; caudâ longissimâ; tarsis longis.*

	unc.	lin.
Longitudo ab apice rostri ad basin caudæ	7	1
——— *caudæ*	8	0
——— ab apice rostri ad basin auris.....	1	6
——— *tarsi digitorumque*	1	$8\frac{3}{4}$
——— *auris*	0	7

Hab. India. (No. 473. in Catal. of the *Mammalia* in the Zoological Society's Museum.)

"General colour very bright cinnamon yellow; the hairs of the upper parts of the body gray at the base; cheeks whitish, a white spot above, and extending behind the eye; the feet and the whole of the under parts of the animal white; the hairs of the same colour at the base as at the *apex*; tail brownish above, dirty-white beneath, the apical third furnished with long blackish hairs; ears blackish, sparingly clothed with white hairs; hairs of the moustaches black, some of those nearest the mouth white.

"This species of *Gerbillus*, which I have great pleasure in naming after M. F. Cuvier, who has published so excellent a monograph on the group to which it belongs, I have reason to believe has long been confounded with the animal described by Major-General Hardwicke, in the eighth volume of the Linnean Transactions, under the name of *Dipus Indicus*. The chief character which induces me to consider it as a distinct species, consists in the comparatively great length of the *tarsus*. In a specimen of *Gerb. Indicus*, which exceeds the present animal in size, I find the *tarsus* to be only 1 inch and 6 lines in length; and in a specimen in the Paris Museum the foot was only a quarter of a line longer, this animal being likewise larger than the specimen which furnished the above description. In the same museum there is also a specimen of the present species, in which the *tarsus* measured 1 inch 9 lin.; the length of the animal being 7 inches 10 lin. In the specimen of *Gerb. Indicus*, and that of *Gerb. Cuvieri*, belonging to the Zoological Society's Museum, there is a considerable difference in the colouring, the latter being paler, and of a much brighter hue than the former; but whether this difference is constant I am not aware."

May 8, 1838.

The Earl of Sheffield in the Chair.

Mr. Waterhouse brought before the notice of the Meeting an extremely interesting series of skins of *Mammalia*, which had recently been given to the Society's Museum by George Knapp, Esq., who had received them from the Island of Fernando Po. The collection included the following seven species, which were considered by Mr. Waterhouse as hitherto undescribed; namely, two new *Colobi*, forming a most important addition to that group of *Quadrumana* of which our knowledge is so extremely limited, from the small number of skins brought to Europe; two new species of *Cercopithecus*; a new Antelope, a new Otter, and a new species of the genus *Genetta*.

These were severally named by Mr. Waterhouse, and the following descriptions and specific characters communicated to the Meeting for publication in the Society's proceedings.

Colobus Pennantii. *Col. suprà nigrescens, ad latera fulvescenti-rufus; subtùs flavescens; caudâ fusco-nigricante; genis albis.*

	unc.	lin.
Longitudo *capitis corporisque*	27	0
——— *caudæ*	29	0

Hab. Fernando Po.

"The prevailing colour is bright rusty-red; the head, back of the neck, and the central portion of the back, are black; the cheeks and throat are white or dirty white; chest, fore part of the shoulders, the under parts of body and inner side of the limbs are dirty yellow; inner side of the thighs whitish; the hairs of the tail are brownish black. The fur is long and not very glossy; that on the head and fore parts of the body being the longest. There is no soft under fur; the hairs are of an uniform colour to the base, or at least in a *very slight* degree paler at that part. The portion of the back which is described as black partakes slightly of the rusty hue which prevails over the other parts of the body; it occupies but a narrow portion of the back, and blends indistinctly into the rust colour. The lower parts of the limbs are removed, but as they are black at the knee, and also assume a deep hue below the elbow, it is probable the remaining portions are black externally; but *internally*, as far as can be seen, the limbs are yellowish or yellow white.

"There was scarcely any perceptible difference in the colouring in all the specimens examined by me, from Fernando Po, amounting to about eight in number. They invariably had white or dirty-white cheeks and throat.

"This species is the nearest yet found to the Bay Monkey of Pennant, but differs in having the throat and cheeks white, and in ha-

ving three distinct shades of colour on the body: Pennant's animal having the cheeks of a pale bay colour, and the body deep bay above, and pale bay beneath. It might be argued that by 'deep bay' Pennant meant to designate the peculiar colour described by me as black with a rusty hue: if so, he could scarcely apply the term '*very bright bay*' to the parts which I call yellow. If, however, even this were the case, there is still another distinct tint which he has not mentioned, and that is the bright rusty-red colour of the sides of the body and limbs. On the whole, therefore, I think I am right in applying a name to the animal here described, which it must be remembered is from a different locality; that of the Bay Monkey being Sierra Leone. There is another circumstance which should lead us to be cautious in pronouncing any species which differs as much as that here described, as identical with Pennant's animal, since it so happens that each red *Colobus* discovered has in its turn been referred to the Bay Monkey, or to the *Simia ferruginea* of Shaw, which is the same animal, and has had one or both of these names applied, but has been changed upon the discovery of the next species; in consequence of which much confusion has arisen. I think we had better let the *Bay Monkey* stand until we can find an animal agreeing with Pennant's description.

Colobus Satanas. *Col. niger; vellere longissimo.*

	unc.	lin.
Longitudo *capitis corporisque*	31	0
——— *caudæ*	36	0

Hab. Fernando Po.

"Of this species I have seen three skins from the same locality, one of these was very imperfect; the other two were perfect, with the exception of the hands and feet. Its uniform black colour will at once distinguish it either from *Colobus leucomeros*, or *Col. ursinus*, the former having white thighs and a white throat, and the latter having a white tail, and long grey hairs interspersed with the black on the neck. The longest hairs on the back measure ten inches. The fur is but slightly glossy, and the hairs are of an uniform colour to the base. There is no under fur.

Cercopithecus Martini. *Cerc. pilis corporis suprà nigro et flavescenti-albo annulatis; capite suprà, brachiis caudâque nigrescentibus; gulâ abdomineque griseo-fuscescentibus.*

	unc.	lin.
Longitudo *capitis corporisque*	22	0
——— *caudæ*	26	0

Hab. Fernando Po.

"Of this animal I have seen but two skins: both very nearly agree in colouring but differ slightly in size; the dimensions are from the larger specimen. The face, hands, and feet, are unfortunately wanting. It appears to be most nearly allied to *Col. nictitans*; the hairs of the upper parts of the body, however, are more distinctly annulated, and the general tint is somewhat greyish. Each hair is

grey at the base, and has the apical portion black, with, generally, three yellowish white rings. The crown of the head and the fore legs are black; the hind legs are blackish, the hairs being but obscurely annulated. The throat is dirty white, the belly and inner side of the legs at the base are of a brownish colour. The tail is black above, and somewhat grizzled at the sides. At the base of the tail beneath there are some deep reddish brown hairs. The naked callosities are small. The hairs on the fore part of the crown of the head are black, annulated with brownish white, and so are those on the side of the face immediately below the ear. The fur is tolerably long, and but loosely applied to the body.

"In the smaller specimen the under parts of the body are somewhat paler than those in the larger, being brownish-grey.

"I have named this species after my fellow curator Mr. Martin.

Cercopithecus erythrotis. *Cerc. griseus; pilis corporis suprà flavo nigroque annulatis; gulâ genisque albis; brachiis nigrescentibus; caudâ splendidè rufâ, lineâ nigrescente per partem superiorem excurrente, apice nigrescente; regione anali auribusque rufis.*

	unc.	lin.
Longitudo *capitis corporisque*	17	0
——— *caudæ*	23	0

Hab. Fernando Po.

"This beautiful little species is about the same size as the Moustache Monkey (*Cerc. cephus*), and has undoubtedly a close affinity to that animal; it may, however, be distinguished by the bright rusty-red hairs which cover the ears internally, its brilliant red tail, and by the hairs in the region of the *anus* being also of a bright red.

"The hairs on the upper parts of the body are black annulated with yellow; on the hinder part of the back the yellow assumes a deep golden hue, but, unlike the Moustache Monkey, the black prevails over the yellow. On the sides of the body and the outer side of the hinder legs, the hairs are greyish; and on the belly and inner side of the limbs, they are greyish-white. The fore legs are blackish externally; a dark mark extends backwards from the eye to the ear; below this, on the cheeks, there is a tuft of white hairs, beneath which the hairs are grizzled black and yellow,—in these respects bearing a close resemblance to the Moustache Monkey. The face is imperfect, and the feet have been removed from the skin; these parts, therefore, cannot be described.

Genetta Poensis. *Gen. fulvescenti-fusca; dorso lineis nigris confluentibus et irregularibus notato; lateribus maculis nigris crebrè adspersis; caudâ nigrâ, annulis fulvis interruptis.*

	unc.	lin.
Longitudo *capitis corporisque*	26	0
——— *caudæ*	18	0

Hab. Fernando Po.

"This species probably approaches nearest in affinity to the *Ge-*

netta Pardina, Is. Geoff., but is distinguished from all the African species with which I am acquainted, by its deep rich yellow-brown colouring, and by the great number of dark markings and spots with which its body is adorned.

"On the back of the neck there are three or four slender longitudinal black lines, which are irregular and indistinct, especially near the head. On each side of these slender lines there is a broad, irregular black mark, which commencing behind the ear runs backwards and outwards over the shoulders; here the slender black lines appear to divide, for as many as seven can be traced; the outermost of these diverge, and are soon broken into irregular spots, which are scattered over the sides of the body. The intermediate lines are also broken into oblong spots, excepting that line which runs along the spine of the back, which is uninterrupted, and becomes broader on the middle of the back. On the hinder half of the back there are, on each side of and parallel with the spinal black mark, two lines formed by confluent spots. The sides of the neck are adorned with numerous oblong spots. The muzzle is black; there is a slender black line between the eyes, a yellow spot below the anterior angle of each eye; the tip of the muzzle is also yellow. The lips are blackish, and the eyes are encircled with black hairs; the hairs of the moustaches are brown, black and brown. The ears are black at the base externally; internally they are covered with yellowish hairs. The limbs are brownish-black. The tail is black; on the basal half there are five narrow yellowish rings, and on the apical half there are about four rings of a brownish colour, and somewhat indistinct. The fur is short, glossy, and adpressed.

LUTRA POENSIS. *Lut. nitidè fusca; genis mento gulâque fulvescentibus.*

	unc.	lin.
Longitudo *capitis corporisque*	24	3
——— *caudæ*	13	0

Hab. Fernando Po.

"The only specimen of this Otter which I have seen is smaller than the common European species (*Lutra vulgaris*); its colour is much brighter, being of a rich yellowish brown; the sides of the face (immediately below the ears), the sides of the muzzle, and the throat, are of a rich deep golden yellow with a faint brownish hue. The ears are small, and covered with hairs of the same colour as those on the top of the head. The tip of the muzzle is bare. The moustaches and long bristly hairs on the sides of the face are brown, paler at the base, and blackish at the *apex*. The tail is about equal to half the whole length of the animal. The fur is short, and the hairs are nearly erect; the under fur is of a brownish-white colour, glossy silk-like nature, and tolerably abundant. There are no feet to the skin.

ANTILOPE OGILBYI. *Ant. splendidè fuscescenti-aurata, subtùs pallidior, lineâ dorsali nigrâ; collo fusco lavato; caudâ brevi et floccosâ, nigrescente, pilis albis subtùs interspersis.*

Hab. Fernando Po.

"The small bushy tail, the character of the fur, which is short and closely adpressed, and the colouring, all indicate in this species, I imagine, an affinity to the *Ant. scripta*, with which it appears to agree in size. The brown neck, deeper and richer colouring, and the absence of white markings on the body, however, will serve to distinguish it from that species. As in *Ant. scripta*, there is a black line along the spine of the back.

"The skin from which the above description is taken is without head or limbs. The length from the shoulders to the root of the tail is about two feet eight inches. The tail is about four and a half inches.

"If my conjectures regarding the affinities of this animal prove correct, it will belong to the sub-genus *Tragelaphus* of Hamilton Smith, or to the more extended group to which Mr. Ogilby has applied the name of *Calliope*.

"I have taken the liberty of naming this animal after the author last mentioned, whose careful researches in the Ruminant animals have thrown considerable light on the affinities of the species."

Mr. Waterhouse then proceeded to notice two skins which had been just brought from Sierra Leone by Major Henry Dundas Campbell, (late Governor of that Colony,) and sent by him for exhibition at the Society's evening meeting, with a promise on the part of Major Campbell to present them to the Museum, in the event of his being able to make an arrangement with a party to whom he had parted with them as an article of commerce. One of these specimens was a remarkably fine skin of a species of *Colobus*, described by Mr. Ogilby in the Society's Proceedings under the name of *Col. ursinus*; the skin, however, upon which Mr. Ogilby founded his species was imperfect, and until the opportunity afforded by the inspection of the present specimen, nothing was known of the colour of the head and face, which prove to be greyish white.

The other skin was a new species of the genus *Cercopithecus*, for which the name of *Cerc. Campbelli* was proposed, with the following character.

CERCOPITHECUS CAMPBELLI. *Cerc. vellere perlongo, subsericeo, per dorsum medium diviso; capite corporeque anteriore griseo-centi-olivaceis, pilis nigro flavoque annulatis; corpore posteriore femoribusque extùs intensè cineraceis; gulâ, abdomine, artubusque internis albis; brachiis externè nigris; caudâ pilis nigris et sordidè flavis indutâ, apice nigro, pilisque longioribus instructo.*

	unc.	lin.
Longitudo *capitis corporisque*	20	0
——— *caudæ*	28	0

Hab. Sierra Leone.

"This species appears to be most closely allied to the *Cercopithecus Pogonias* of Mr. Bennett; it has not, however, the black back which serves to characterize that animal.

"The most remarkable characters in this animal are its long fur,

and the hairs being divided on the back, as in most of the species of the genus *Colobus*. The average length of the hairs of the back is about two and a half inches; on the hinder half of the back, however, they exceed three inches. These hairs are grey at the base, and the remaining portion of each hair is black, with broad yellow rings, the latter colour prevailing. On the posterior half of the body, and the outer side of the hinder legs, the hairs are of a deep slate grey, and almost of an uniform colour; some of those on the middle of the back are obscurely freckled with deep yellow, and those on the thigh are very indistinctly freckled with white. The belly, inner side of limbs, fore part of thigh, chest and throat are white. The hairs of the cheeks and sides of neck are very long, and of a greyish white colour, grizzled towards the apex with black and yellow; some whitish hairs tipped with black are observable across the fore part of the forehead. The inner side of the ears is furnished with very long hairs of a greyish white colour, obscurely annulated with grey and pale yellow; these hairs vary from three quarters to one inch in length. The fore legs are black externally, and the hairs on this part are comparatively short. The hairs on the upper side of the tail are grizzled with black and dirty yellow, and on the under side with black and brownish white. The apical portion of the tail, which is furnished with longish hairs, (as in *Cerc. Pogonias*), is black, the black hairs occupying about one third of the whole length of the tail.

"I have named this animal after the late Governor of Sierra Leone, Major Campbell, that gentleman being its discoverer."

Mr. Ogilby exhibited and described various species of Kangaroo Rats (*Hypsiprymnus*) from the Society's Collection, and read extracts relating to them from a paper which he had prepared upon the subject so long ago as the year 1832; and which, though partly read before the Linnean Society at that time, had never been made public, owing to the imperfection of the materials then in this country for the perfect illustration of the genus. Reserving the detail of his observations for an express monograph, Mr. Ogilby briefly characterized the following species:—

1. *Hyp. setosus*: described in the Proceedings for 1830–31, p. 149.

2. *Hyp. myosurus*: easily distinguished from all the other species by its much shorter tail and *tarsus*; the former organ being scaly, as in the true Rats.

3. *Hyp. melanotis*: a large species with longer ears than its congeners, and readily distinguished by the dark brown colour of the hair which covers the organs, as well as by its superior size. In the Zoological Society's Museum.

4. *Hyp. formosus*: a beautiful small species of a light russet-brown colour, the latter half of the tail white. This species has been for many years in the Collection of the Linnean Society.

5. *Hyp. Phillippi*: pale brown, with a slight shade of russet above, dirty white beneath; tail long, cylindrical, covered with short, ad-

pressed yellowish white hairs beneath, and with reddish brown woolly fur on the upper surface, terminated by a tuft of dirty yellowish brown; ears elliptical; head small and attenuated; *tarsus* long, and of a pale greyish white colour; middle upper incisors not so much longer in the lateral as in *Hyp. murinus*, and lower shorter and slenderer; the canines are nearly in contact with the lateral incisors, and of the same form and size. This is the species described in Governor Phillipp s Voyage. that figured by White appears to be *Hyp. myosurus*. Described from two specimens in the Linnean Society's Collection.

6. *Hyp. Cuniculus*: in size and colour something resembling *Hyp. Phillippi*, but of a clearer grizzled brown colour, something like that of the wild rabbit; a dark brown patch marks the nose; tail long, cylindrical, and terminated by a tuft of coffee-coloured wool; upper middle incisors very large, separated from one another and truncated; the lower of the same form, but considerably shorter than in any other species, and the canines much smaller than the contiguous lateral incisors, and separated from them by a distinct bar or vacant space; by all which characters this animal differs from *Hyp. Phillippi*, as well as by its larger and thicker head and clearer grey colour.

7. *Hyp. murinus*: of nearly the same colours as the last two species, but readily distinguished by its short, thick head, blunt, unattenuated muzzle, and very short ears bordered with red: the teeth also afford a very distinctive character; the lower incisors are twice as long as in the last species, the upper not much longer than the lateral, and the canine only half the size of the contiguous incisor, and nearly in contact with it, being separated only by the third part of a line, the tail is furnished with an erect crest of black hair for three or four inches towards the tip: this is the "Potoroo" of the French Zoologists, as Mr. Ogilby had verified by comparison with the Paris specimens. Mr. Ogilby remarked that by an oversight for which he was accountable, the Society's specimen of this animal is called *Hyp. setosus* in the recently published Catalogue of the Mammalogical part of the Collection.

Mr. Martin then brought before the notice of the Meeting three species of Chameleon from Fernando Po, forming part of Mr. Knapp's donation, and upon which he proceeded to offer the following observations.

"Among the collection of specimens from Fernando Po lately presented to the Zoological Society are three chameleons of peculiar interest. One of them is the *Cham. tricornis*, or *Oweni* of Mr. Gray; the second is the *Cham. cristatus* of Mr. Stutchbury, described and figured in the 3rd Part of the 17th Vol. of the Linn. Trans. The third appears to me to be undescribed.

"With regard to the specimen of *Cham. cristatus*, I may be permitted to point out some trifling differences between it and the figure given by Mr. Stutchbury. The crest ceases to be elevated over the loins and base of the tail, degenerating into an acute ridge, whereas in the figure it continues for a considerable distance along

the upper aspect of the tail, and is as elevated over the loins as over the chest. The tail is shorter in proportion in the present specimen; the indentations which margin the casque are less bold and decided, and the casque itself is less produced posteriorly. The dorsal crest is supported by only ten spinous processes. The colour is slate gray, with a yellow abdominal line, but without the orange and dark reticulated lines observed by Mr. Stutchbury in his specimen.

Length of head and body .... $3\frac{1}{2}$ inches.
——— tail ..... $2\frac{3}{4}$

"As the specimen described and figured by Mr. Stutchbury came from the river Gaboon, Western Equinoctial Africa, and the specimen belonging to the Zoological Society from Fernando Po, it is possible that they may be examples of permanent varieties; but I am rather inclined to attribute the difference to age or sex, or to both combined. Mr. Stutchbury's specimen is probably an adult male; that belonging to the Zoological Society is a young female. The *Cham. Oweni*, Gray (*Cham. tricornis*, Gray), differs from a specimen from Fernando Po, (collected by Lieut. Allen) in the possession of the Society, only in having the horns less developed. With respect to the species I regard as undescribed, I beg to offer the following observations:—

"At a first glance this Chameleon might be confounded with *Cham. Senegalensis*, or with *Cham. dilepas*; the grainlike scales of the body and the general contour of the head and body being much alike in each. When, however, we come to examine more closely, we shall find sufficient reason to regard it as entirely distinct. Both in *Cham. Senegalensis* and its immediate ally (if it be truly a separate species), *Cham. dilepas*, the dorsal ridge and also the median line of the throat and abdomen are strongly denticulate. In this, however, neither the dorsal ridge, nor the abdominal or gular median line, present any such character. In *Cham. Senegalensis* the tail is remarkably stout at the base, the skin behind the knee-joint is close, and there is a sort of heel, or angular projection (at least in the specimens before me), at the posterior junction of the two portions of the hind-foot. In the Chameleon which I regard as undescribed the tail is slender at the base and long, the skin behind the knee-joint is loose and fanlike, and there is no angular projection or heel.

"The granulations of the body, it may also be observed, are much less acutely elevated (being smaller and rounder) than in *Cham. Senegalensis*.

"The casque between the eyes is comparatively narrower, being there contracted; it is broader and more rounded however posteriorly, and is less produced. The middle line or keel is a little more distinct; and between the eyes the casque is more deeply and abruptly concave; a very small flap or ear, which indeed might easily be overlooked, is produced from the posterior part of the casque, and lies on each side of the neck, as in *Cham. dilepas*; but as we have said, in this species the dorsal ridge and the median line of the throat and belly are strongly denticulate, or as Daudin said of its ally the *Cham. Senegalensis*, '*dentelés en scie.*'

"Regarding then this species as hitherto undescribed, I propose for it the name of *Chamæleon Bibroni*, as a tribute of respect to M. Bibron, of the Musée d'Histoire Naturelle of Paris, the merit of whose work on Reptiles, from which I have derived so much advantage, I am anxious thus publicly to acknowledge; and to whom, during his late visit to London, I am indebted for assistance and information, while engaged with the collection of *Sauria*, in the possession of this Society.

"The characters of *Cham. Bibroni* may be summed up as follow: Casque (or upper surface of the skull) flat, with a very slight occipital keel; contracted and concave between the eyes, rounded posteriorly: superciliary ridge very little elevated, and becoming obsolete over the nostrils; a small flap on each side from the posterior edge of the casque lies on the neck; the dorsal ridge and median line, both of the throat and belly, destitute of a denticulated crest. The grains of the body and limbs small and close-set, those of the casque flat and angular.

Chamæleon Bibroni. *Galeâ planâ; vix apud occiput carinatâ; inter oculos angustâ et concavâ; posticè rotundatâ, et lobo parvulo utrinque instructâ; margine superciliari parùm elevato, et super nares obsoleto; culmine dorsali, lineâque mediâ per gulam et abdomen tendente, absque denticulis; corpore granis parvis et confertis tecto; galeâ lamellis angularibus.*

Longitudo corporis cum capite	4 unc.
——— *caudæ*	5½

Hab. in Insulâ Fernando Po.

"In proportion to the size of the body the head of *Cham. Bibroni* is short, and particularly the muzzle, which is very acute at the apex. Viewed from above the helmet it would present an elongated *oval*, rounded behind and acute anteriorly, were it not for its contraction between the eyes, which is not the case in *Ch. Senegalensis*. The accessory lobes at its posterior part are very small, and might easily be overlooked. Perhaps, however, they may be larger in the male, (for the present individual, it is to be observed, is a female,) but of this I have no means of judging. The length and slenderness of the tail are remarkable. The granulations of the body are small and even. The general colour is purplish black, passing on the sides of the belly, on the loins, and posterior limbs, into olive green; the inside of the limbs, and the median line of the abdomen, are pale reddish yellow."

May 22, 1838.

Richard Owen, Esq., in the Chair.

A letter was first read, dated Sierra Leone, February 19, 1838, addressed to Mr. Rees, the Assistant Secretary, from F. Strachan, Esq., Corresp. Memb.

The writer in this letter expresses the warm interest which he takes in the furtherance of the Society's scientific objects, and states, that both himself and his friends are making exertions to procure skins and living animals. Referring to the Chimpanzee, Mr. Strachan observes, that only two had been brought over to Freetown during the late rains, both of which he believes to be on their way to England; he also remarks, that there would be no great difficulty in procuring a young *Hippopotamus*, and that it might probably outlive the voyage to England if brought home in a man of war.

The Rev. F. W. Hope exhibited a piece of deal, perforated throughout by the *Limnoria terebrans*, and in which many of these destructive animals might still be detected. Mr. Hope stated that the piles of the pier at Southend, which were of oak, had been cased with deal, and then surrounded with a sheathing of iron, to protect them from the ravages of the *Limnoria*; but, instead of producing the desired effect, this plan appeared to have accelerated their destruction, as the *Limnoria* made its way from beneath between the sheathing and *the pier*, and very quickly destroyed the deal casing, as shown by the piece he exhibited. Mr. Hope believed that wood could not by any means be effectually protected from this animal if exposed to its attack; and that iron, protected from the decomposing action of the water by some varnish, although requiring a much greater outlay at first, would in the end be found the least expensive of the two.

A specimen of the Anchovy, interesting from the circumstance of its having been captured in the Thames, was exhibited by Mr. Yarrell, who remarked that although this was the first instance of the kind that had fallen under his observation, yet as the Anchovy is plentiful along parts of the Devonshire and Cornwall coast, it was not improbable that its occurrence in the above river would be occasionally detected, if the nets of the white-bait fishermen were examined.

Mr. Waterhouse then laid before the Meeting a collection of specimens received from Mr. Cuming, consisting of a considerable number of birds, with skins of *Mammalia*, &c.: among the latter were several new or rare species, including specimens of the genera *Tarsius*, *Galeopithecus*, *Sciurus*, and *Paradoxurus*.

The scientific value of the above donation was much increased by some manuscript notes made by Mr. Cuming upon several of the ani-

mals, giving their native names, and information relative to their habits. Of one of these, a species of *Galeopithecus*, Mr. Cuming remarks :—

"The *Caguang* is an inoffensive animal, inhabiting lofty trees in dark woods, and is known to feed upon the leaves of the Nanka or Jack Fruit; it suspends itself from the upper branches of the tree by all its feet, which gives it a large appearance, as it brings them all four together.

"It flies heavily for about a hundred yards on an inclined plane, but readily ascends the trees by its strong claws; it makes a weak noise similar to geese when at rest: when the calls of nature operate on the animal, it erects its tail and membrane up to the back part of the neck, which gives it a most singular appearance. They are easily taken by the natives throwing nets over them, or by cutting down the tree on which they are; and before they can clear themselves of the branches are taken hold of by the hand. I never saw one of them attempt to bite. When the female has young she is very easily taken. They appear much attached to their young, which are always hanging at the breast. Of late years great numbers of them have been taken for the sake of their skins, which meet with a ready sale at Manilla. They are found on the islands of Bohol and Mindanado."

Another of the specimens was the *Tarsius spectrum* of Geoffroy, of which Mr. Cuming's *memoranda* furnished the following interesting details :—

"The *Malmag* is a small animal living under the roots of trees, particularly the large bamboo of these islands. Its principal food is lizards, which it prefers to all other. When extremely hungry, I have known it to eat shrimps and cock-roaches, and give a great preference to those which are alive. It is very cleanly in its habits, never touches any kind of food that has been partly consumed, and never drinks a second time from the same water. It seldom makes any kind of noise, and when it does emit sound it is a sharp shrill call, and only once. On approaching it in its cage, it fixes its large full eyes upon the party for a length of time, never moving a muscle: on drawing nearer, or putting anything near it, it draws up the muscles of the face similar to a monkey, and shows its beautiful sharp regular set teeth. It laps water like a cat, but very slowly, and eats much for so small an animal. It springs nearly two feet at a time. It sleeps much by day, is easily tamed, and becomes quite familiar, licking the hands and face, and creeping about your person, and is fond of being caressed. It has an aversion to the light, always retiring to the darkest place. It sits upon its posteriors when it feeds, holding its food by its fore paws; when not hungry, it will ogle the food for a considerable time. A male and female are generally seen together: the natives of these islands make sure of taking the second having secured the first. They are extremely scarce in the island of Bohol, and only found in the woods of Jagna and the island of Mindanado.

"The calls of nature seldom operate; the *fæces* are similar to those of a dog, and large for so small an animal.

"It produces one at a time. I had the good fortune to procure a female without knowing her to be with young: one morning I was agreeably surprised to find she had brought forth. The young appeared to be rather weak, but a perfect resemblance to its parent: the eyes were open and covered with hair; it soon gathered strength, and was constantly sucking betwixt its parent's legs, and so well covered by its mother, that I seldom could see anything of it but its tail: on the second day it began to creep about the cage with apparent strength, and even climb up to the top by the rods of which the cage was composed. Upon persons wishing to see the young one when covered over by the mother, we had to disturb her, upon which the dam would take the young one in its mouth, in the same manner as a cat, and carry it about for some time; several times I saw her when not disturbed trying to get out of the cage, with the young one in her mouth as before. It continued to live and increase in size for three weeks, when unfortunately some person trod upon the tail of the old one, which was protruded through the cage, a circumstance which caused its death in a few days: the young one died a few hours after, which I put into spirits. The skin, with its tail crushed, is in the box with the other animals. I should recommend its being placed in the attitude of springing, with the body a little bent forward; ear erect and round; eyes very full of light; chestnut colour; pupil black and small; the nails or claws two in number, erect, such as they are at all times.

Jagna, Isle of Bohol, August 1837. "H. Cuming."

Among the collection sent by Mr. Cuming to the Society were specimens of two species of Saurian Reptiles, upon which, at the request of the Chairman, Mr. Martin offered some remarks.

The first species to which he adverted was the *Istiurus Amboinensis* of Cuvier: two specimens of this rare reptile, both males, were procured by Mr. Cuming in the Island of Negros. The *Istiurus Amboinensis*, from the circumstance of the male being furnished with an elevated crest or fan, supported by the spinous processes of the base of the tail, in which respect it agrees with the Basilisk, was placed by Daudin in the same genus with this latter reptile, and characterized as the *Basiliscus Amboinensis*, and in this arrangement Daudin was followed by most succeeding writers. So little allied, however, in reality, are these two reptiles (though possibly they may be the representatives of each other in different quarters of the globe), that they belong to two different sections of the *Sauria*, of which one has the Old World, the other the New World, for its range. The Basilisk (*Basiliscus mitratus*, Daud.), with all the American genera of the Iguanian group or *Eunotes* of Dumeril and Bibron, belong to the section of that group termed *Pleurodonta*, distinguished by the situation of the teeth, which rise from a furrow along the internal aspect of each jaw; whereas the *Istiurus*, with all the Old World genera of the Iguanian group, (the genus *Brachylophus*, of which there is only one species, alone excepted,) belong to the section termed *Acrodonta*, distinguished

by the teeth being firmly fixed along the very ridge of each jaw, instead of having an insertion in a lateral furrow. The first discovery of the true characters of the *Istiurus* is due to Mr. Gray, who instituted a genus for the reception of this species, and also of two others allied to it, (one of these being the *Physignathus Cocincinus* of Cuvier,) under the title of *Lophura*. In the last edition of the Règne Animal, Cuvier, though he admits the justness of Mr. Gray's views respecting the Amboina Lizard, still retains the genus *Physignathus* for the Cochin Chinese one, but he changes the term *Lophura* into *Istiurus*; his reason being that the word *Lophura* approaches too nearly the term *Lophyrus* already applied by Daudin to a different genus. MM. Dumeril and Bibron adopt the generic title proposed by Cuvier, and also receive into the genus the *Physignathus Cocincinus*, under the title *Istiurus Physignathus*; they add, moreover, a third species under the name of *Istiurus Lesueuri*, originally described by Mr. Gray as the *Lophura Lesueuri*. Mr. Martin observed, that the presence of the elevated fan at the base of the tail, which occurs only in the males of *Istiurus Amboinensis*, was a circumstance of interest, inasmuch as it involves a structural difference between the osteology of both sexes. In the common Water Newt, the male of which acquires fanlike membranes at a certain season of the year, the membrane is unsupported by an osseous frame-work, and is deciduous, or rather temporary; but in this animal, while the use of such a fan may be in all probability connected with sexual functions, it is a persistent appendage. The locality from which the specimens were derived gives them additional value.

The next species to which Mr. Martin requested the attention of the meeting was a *Varanus* from the Isle of Mindanado, which he regarded as hitherto undescribed.

This *Varanus*, he observed, appeared to be closely allied to *Varanus chlorostigma*, Dum. and Bibr., differing, nevertheless, materially in the character of the scales of the body, and in the distribution of its markings. As in *Varanus chlorostigma* and *Var. bivittatus*, the suborbital scales consist of a crescent of plates, broader than long, encircled by small plates, which latter cover the suborbital margin. The nostrils are rounded, and placed on each side of the muzzle rather nearer the apex than in *Var. chlorostigma*; the teeth are also compressed with sharp edges very minutely dentated; the head is more produced than in *Var. chlorostigma*, being, in this respect more like that of *Var. bivittatus*; and the scales are larger, coarser, and more irregular.

For this new *Varanus*, Mr. Martin proposed the name of *Varanus Cumingi*.

VARANUS CUMINGI. *Varan. caudâ compressâ, naribus ferè rotundatis et rostri apicem versus positis; lamellis suborbitalibus inæqualibus, septem vel octo ceteris quoad magnitudinem præstantibus latissimis, lineamque semilunarem efficientibus; dentibus compressis, acutis, et delicatè serratis; corpore suprà nigro, guttis ocellisque flavis ornato; abdomine aurantiaco.*

Hab. apud Insulam Mindanado.

The head of this *Varanus* is elongated as in *Var. bivittatus*, and the nostrils have the same situation, but are rounded, and the nasal pouches are situated as in *Var. chlorostigma*. The posterior teeth are larger than the anterior, but all are recurved, compressed, with sharp edges and point, and very minutely serrated. The upper surface of the head is covered with flat polygonal scales, arranged in a system of circles. On the superorbital region seven or eight scales, much broader than long, form a sort of crescent. The scales of the back of the neck are large, oval, convex, and distinctly encircled with small, granulous scales ; on the sides of the neck they become smaller. The *rami* of the lower jaw are covered with rather large oblong scales disposed in parallel lines; and the throat and interspace between the *rami* are furnished with scales of a similar character, but very small. On the back, the scales are oval, and slightly keeled; the largest are those down the middle of the back, whence they become gradually smaller as they approach the sides. The scales of the *axillæ* are very small, flat, and circular; those covering the outer aspect of the arms, large, pointed, and subcarinate. The thighs are covered anteriorly with large square flat scales, having indications of a keel, while the leg from the knee downwards is covered externally with pointed scales, each strongly and sharply keeled. On the inside of the thighs the scales are moderate and circular. The scales of the abdomen and tail resemble those of *Varanus bivittatus*, but the double ridge of the tail is comparatively more feeble and less elevated. The toes are long, the claws large, compressed, and hooked.

The ground colour of the upper surface is black; the *apex* of the muzzle, a transverse bar behind the nostrils, a second about an inch beyond, a smaller between the eyes, and a large space on the top of the head, are bright yellow; the edges of the upper lip are yellow, and a yellow stripe extends from the back of the eye to the ear; an irregular, but somewhat triangular mark of yellow occupies the back of the neck, whence a line of yellow spots, or, as in one specimen, a continuous line, runs between the shoulders. The back is crossed by yellow spots, or by *ocelli*, forming six or seven interrupted bars; sometimes the back is more irregularly marked, the interrupted bars being obscure, and the interspaces numerously dotted with yellow scales amidst the black: one of the three specimens is thus coloured; the limbs externally are irregularly spotted with yellow, and the tail is banded with the same. The whole of the under surface, from the chin to the base of the tail, the *axillæ*, and inside of the thighs, are orange yellow.

Length of the largest of the three specimens (each apparently adult).

	ft.	inch.
From the muzzle to the posterior margin of the ear	0	3
From the ear to the root of the tail....	1	3
Tail	2	4

June 12, 1838.

The Rev. F. W. Hope in the Chair.

Mr. Owen communicated to the Meeting another portion of the results attending his examination of the body of the *Apteryx*, embracing a description of the parts connected with the function of respiration, and their general relations, as shown in this extraordinary bird, to that structure of the respiratory organs which is so eminently characteristic of the entire class.

Mr. Owen remarks, that the system of respiration in birds is so obviously framed with especial reference to the faculty of aerial progression, and the peculiarities in the former exhibit so marked a physiological relation to the latter, that in the *Apteryx*, where the wings are reduced to the lowest known rudimentary condition, the examination of the accompanying modifications in the respiratory apparatus presented a most interesting subject for inquiry.

Upon carefully removing the *viscera* from the abdomen, Mr. Owen was both gratified and surprised at finding no trace of air-cells in the abdominal cavity; the *diaphragm* being entire, and pierced only for the transmission of the *œsophagus* and larger blood-vessels, as in the *Mammalia*.

The position of the *diaphragm* was almost horizontal, like that of the *Dugong*, differing from it principally in relation to the heart and *pericardium*, which projected into the abdominal cavity, as through a hernial aperture, the *aponeurosis* of the *diaphragm* being continuous over the *pericardium*; an approach towards the oviparous type in the disposition of the *viscera* being thus preserved.

In the origins of the *diaphragm* Mr. Owen found the *crura* of the lesser muscle exhibiting a greater degree of development than is known to exist in any other bird; the *crura* were entirely tendinous, and arose from slight projections at the sides of the last costal *vertebræ*, their fibres expanding and being lost in the large aponeurotic centre; at the point of their expansion to join the *aponeurosis* a small proportion of muscular fibre was observed.

The abdominal surface of the *diaphragm*, as in the *Mammalia*, was principally in contact with the convex surface of the liver, but the thoracic surface of the former was separated from the lungs by a series of small but well-marked air-cells, one of which projected slightly through the anterior aperture of the thoracic-abdominal cavity at the base of the neck; the *Apteryx* thus still retains the ornithic type of structure, although presenting us with the only known instance, in the feathered race, of a species in which the receptacular portion of the lungs is not extended into the *abdomen*.

The lungs were each of an irregular sub-compressed triedral figure, broader anteriorly and contracted towards the posterior ex-

tremity; they were fixed to the posterior part of the chest in a plane nearly parallel with the axis of the trunk, and were perforated by large apertures for the passage of air from the bronchial tubes into the air-cells.

The bronchial divisions of the *trachea* entered the lungs about one-fifth of their length from the anterior end, and immediately formed four principal branches, two (a small one and the largest) supplying the respiratory portion of the lung itself, and the other two terminating by openings into the thoracic air-cells previously noticed. The course of these divisions of the *trachea* is severally described by Mr. Owen, and he also enters into details respecting the number and position, &c. of the air-cells.

In the simplicity of its structure the *trachea* resembled that of the struthious birds, but there was no trace of a dilated membranous pouch as in the Emeu. The *trachea* consisted of 120 small rings, becoming gradually smaller to the last 20, and alternately overlapping and being overlapped at the sides, during the relaxation of the tube. The upper *larynx* was not defended by any rudimental *epiglottis*, nor provided with retroverted spines or *papillæ*; a small process projected from its anterior part halfway across the laryngeal area. There was no lower *larynx*; the rings of the *bronchi*, with only a slight diminution of thickness, were continued from the last two of the *trachea*, which latter were increased in size. The *trachea* was closed below by a membrane completing the bronchial cartilages at their under part, and the half-rings of the *bronchi* were completed by a tympaniform membrane both above and below.

There were two of the so-called *sterno-tracheales* muscles arising one from the inner surface of each coracoid.

Mr. Owen remarks that the fixed condition of the lungs, and the existence of air-cells between the lungs and the *diaphragm*, clearly prove that inspiration cannot be effectually performed by the action of the *diaphragm* alone, but that it takes place in the *Apteryx* as in other birds, by the *sternum* being depressed, and the angle between the vertebral and sternal ribs being increased.

A communication was then read to the Meeting by Dr. Cantor, entitled, "A notice of the *Hamadryas*, a genus of Hooded Serpents with poisonous fangs and maxillary teeth."

Dr. Cantor commences with observing, that "since Dr. Russell embodied the results of his investigations in his unequalled work upon Indian Serpents, the attention which this branch of Indian zoology has received has been chiefly confined to occasional discoveries of *single* species; and yet from experience I have been convinced how rich this branch is, and how much still is left to be illustrated, not only with regard to species, but also with regard to the habits and the geographical distribution of this order of reptiles, the number and variety of which forms so prominent a feature in the zoology of Southern Asia.

"The venomous serpent, to which I shall here call attention, is the type of a new genus; which, from its inhabiting hollow trees and

frequenting the branches, I propose to call *Hamadryas*. Its characters induce me to assign it a place between the genera *Naja*, Laurenti, and *Bungarus*, Daudin, which two forms it will be found to connect together.

HAMADRYAS.

Caput latum, subovatum, deplanatum, *rostro* brevi obtuso, *scutis* quindecim superne tectum.
Buccæ tumidæ.
Oculi magni prominentes, *pupillâ* rotundâ.
Nares latè apertæ, duorum scutorum in confinio.
Oris rictus peramplus, subundatus.
Tela antica, pone qua dentes maxillares.
Collum dilatabile.
Corpus crassum, teres, *squamis* lævibus, per series obliquas dispositis, imbricatim tectum.
Cauda brevis, apice acuto, *scutis* et *scutellis* tecta.

HAMADRYAS OPHIOPHAGUS. *Ham. supernè olivaceo-viridis, striis sagittalibus nigris cinctus, abdomine glauco, nigro marmorato.*

Scuta abdominalia a 215 ad 245
Scuta subcaudalia a 13 ad 32
Scutella subcaudalia a 63 ad 71

Hab. Bengal.

Hindustanee name, 'Sunkr-Choar.'

"For the description and anatomical details, I beg to refer to my provisional description, published in the Asiatic Researches, vol. xx. p. 87., while I shall here confine myself to some general remarks upon the habits, the effects of the poison, and the history of this serpent.

"The *Hamadryas*, like the *Bungarus*, *Hydrus*, and *Hydrophis*, has a few maxillary teeth behind the poison-fangs, and thus like the latter connects the venomous serpents with isolated poison-fangs to the harmless, which possess a complete row of maxillary teeth.

"Of the terrestrial venomous serpents the *Bungarus* is chiefly characterized by a distribution of the teeth similar to that of the *Hamadryas*, which, also partaking of the chief characteristic of the genus *Naja*, viz. that of forming a hood or disc, constitutes an immediate link between the genera *Bungarus* and *Naja*.

"In consequence of the strong resemblance in the general appearance between the *Naja* and the *Hamadryas*, when first my attention became attracted to the latter, I thought I could refer this serpent to that genus; and it was not until I was able to examine a specimen whose poison-fangs were untouched (those of the first specimens I saw having been drawn by the natives, who are greatly afraid of this serpent), that I discovered the maxillary teeth behind the poison-fangs.

"*Hamadryas ophiophagus* differs from the *Naja tripudians*:

1. By its maxillary teeth.
2. By the strongly developed spines on the *os occipitale inferius*.

3. By the integuments covering the head.
4. By the integuments covering the abdominal surface of the tail.
5. By its colour.
6. By its size.

"According to the natives the *Hamadryas* feeds chiefly upon other serpents; in one I dissected I found remains of a good-sized *Monitor*, which fact may account for its arboreal habits, as I have in Bengal, along the banks of the rivers, observed numbers of those large lizards among the branches of trees watching for birds.

"The power of abstaining from food, generally speaking, so characteristic of the serpents, is but in comparatively small degree possessed by this species; the most protracted starvation amounts to a period of about one month, while the *Vipera elegans*, the *Naja tripudians*, and the *Bungarus annularis*, have, without inconvenience, been confined in cages without any food for more than ten months. Two specimens of the *Hamadryas* in my possession were regularly fed by giving them a serpent, no matter whether venomous or not, every fortnight. As soon as this food is brought near, the serpent begins to hiss loudly, and expanding the hood rises two or three feet, and retaining this attitude as if to take a sure aim, watching the movements of the prey, darts upon it in the same manner as the *Naja tripudians* does. When the victim is killed by poison, and by degrees swallowed, the act is followed by a lethargic state, lasting for about twelve hours. Such of the other Indian venomous serpents, the habits of which I have had opportunity to study from life, show themselves much inclined to avoid other serpents, however ready they are to attack men or animals, when provoked or driven by hunger; and I am not aware of any other of those serpents being recorded as preying upon its own kind. A short time ago, however, during my sojourn at the Cape of Good Hope, I received from high authority the following fact, which throws a light upon the habits of the *Naja* of southern Africa, one of which, when being captured, threw up the body of a *Vipera arietans* (*Vip. brachyurus*, Cuvier), which bore marks of having been submitted to the process of digestion.

"The *Hamadryas*, like the greater number of Indian serpents, evinces a great partiality to water; with the exception of the tree-serpents (*Leptophina*, Bell), they all not only drink, but also moisten the tongue, which, as this organ is not situated immediately in the cavity of the mouth, become in the serpents two different acts *. Specimens of this serpent in my possession changed the skin every third or fourth month, a process which takes place in all the Indian ser-

* M. Schlegel is of opinion that serpents never drink. (*Essay sur la Physiogn. des Serpens, Partie Generale.*) As mentioned above, I have had opportunities of ascertaining that the greater number of Indian serpents are very fond of water, a fact which I am aware has also been observed in the African serpents by the eminent naturalist Dr. A. Smith, whose valuable discoveries, which he is at present engaged in publishing, will bring to light many facts, of which we are at present in almost total ignorance concerning the habits of animals, particularly those of the Reptiles.

pents several times during the year. The *Hamadryas* is very fierce, and is always ready not only to attack but to pursue when opposed; while the *Cophias*, the *Vipera*, the *Naja*, and the *Bungarus*, merely defend themselves, which done, they always retreat, provided no further provocation is offered. The natives of India assert, that individuals are found upwards of twelve feet in length, a statement probably not exaggerated, as I have myself seen specimens from eight to ten feet in length, and from six to eight inches in circumference. I have often heard it asserted, that 'Cobras' (which name is naturally enough given to every hooded serpent,) have been met with of an enormous size, but I strongly doubt their belonging to the genus *Naja*: among a considerable number which have come under my observation, I never saw any exceeding five to six feet in length, while the common size is about four feet. Some time before I discovered the *Hamadryas*, I was favoured by J. W. Grant, Esq., of the Hon. Company's Civil Service, with an interesting description of a gigantic hooded serpent he had observed in the upper provinces, and which, he remarked, was not a *Naja*. By inspection this gentleman denied the *Hamadryas* to be identical with the above-mentioned.

"The natives describe another hooded serpent, which is said to attain a much larger size than the *Hamadryas*, and which, to conclude from the vernacular name, '*Mony Choar*', is perhaps another nearly allied species.

"The fresh poison of the *Hamadryas* is a pellucid, tasteless fluid, in consistence like a thin solution of gum arabic in water; it reddens slightly litmus paper*, which is also the case with the fresh poison of the *Cophias viridis*, *Vipera elegans*, *Naja tripudians*, *Bungarus annularis* and *Bung. cæruleus*: when kept for some time it acts much stronger upon litmus, but after being kept it loses considerably if not entirely its deleterious effects.

"From a series of experiments upon living animals, the effects of this poison come nearest to those produced by that of the *Naja tripudians*, although it appears to act less quickly. The shortest period within which this poison proved fatal to a fowl, was fourteen minutes; whilst a dog expired in two hours eighteen minutes after being bitten. It should however be observed, that the experiments were made during the cold season of the year."

A specimen of the present genus (*Hamadryas*), in the Collection of the Society, was upon the table, having been presented to the Museum by Sir Stamford Raffles, but without any facts respecting its history, or the locality in which he had procured it.

* "M. Schlegel asserts (loc. cit. p. 34,) the venom is 'ni alcalin ni acide.' The only way in which I can account for this mistake from a man who ranks among the first Erpetologists, is by supposing that M. Schlegel himself never had an opportunity of testing the poison of a living serpent; for besides the five above-mentioned genera of Indian venomous serpents, I found the fresh poison of different species of marine serpents (*Hydrus*) to possess the property of turning litmus paper red. The same fact with the *Crotalus* is noticed by Dr. Harlan, who says, 'The poison of the living *Crotalus* tested in numerous instances with litmus paper, &c. invariably displayed acid properties.' (Vide Harlan, Medical and Physical Researches, p. 501, sq.)"

Mr. Yarrell called the attention of the Meeting to some specimens of fish presented by Mr. Harvey, of Teignmouth, whom he stated to be on the point of quitting England for a residence in Australia, and to whose zealous exertions as a Corresponding Member the Society had on many occasions been largely indebted.—The following vote of thanks was proposed and carried unanimously :—

"That the thanks of the Meeting be offered to Mr. Harvey, Corresponding Member, for the services he has already rendered to the Society, and that he be assured of the cordial desire experienced by his fellow Members for his welfare and success in his new undertaking."

June 26, 1838.

William Horton Lloyd, Esq., in the Chair.

A specimen of the Peregrine Falcon was upon the table, which had been sent to the Society's office as a donation to the Menagerie, with the following letter addressed to Mr. Rees, from the donor, Capt. Charles Robertson :—

"Sir,

"I beg to present to you the accompanying Hawk, which was caught on board the ship Exmouth, on the 12th of February last, on her passage from Bengal to London, when in about latitude 12° north, and longitude 88°·30 east, which placed the ship about 300 miles from the Andaman Islands; and from observing the bird's tendency to fly away towards the east about the time of sunrise, for some days after it was caught, I am led to suppose that it must have been blown off, or followed its prey till out of sight of, those Islands. At the time that it was taken, it was in the act of devouring the remains of a sea bird on the main-topsail yard, which it had previously been seen to pounce down upon and take up from the sea.

"The injured leg was occasioned by a ring, to which it was attached when first caught, and the struggles of the bird to get away; but I have great hopes that it will regain in some measure the use of it by proper care and attention, which I was unable to give it; and it is now much improved to what it was, the two parts being more inclined to unite. I have fed it upon raw fresh meat, and young rats occasionally, but it never looks at water. When approaching the coast of England, it was very remarkable that the bird again struggled to get away in the direction of the land, although we were so far off as not to see it from the ship. I am not aware that this hawk differs from the common species, but the circumstances attending it may be interesting to a naturalist; and if it should be thought worthy of being added to your collection, I shall feel amply repaid for the trouble I have taken to preserve it.

"This is the second instance of a hawk being taken by me out of sight of land; and on the former occasion a sparrow took refuge in the cabin: we were at that time about 80 miles from Ceylon. From these circumstances it is evident that hawks traverse great spaces of the ocean, being able to feed on the wing.

"I remain, Sir, your obedient Servant,

"Charles Robertson."

18, Alfred-place, Bedford-square,
26th June, 1838.

The first part of a paper was then read by Mr. Blyth, entitled, "Outlines of a Systematic Arrangement of the class *Aves*."

July 10th, 1838.

Wm. Ogilby, Esq., in the Chair.

A letter dated Tymaen Pyle, Glamorganshire, May 14th, 1838, was read, addressed to the Secretary by J. E. Bicheno, Esq., accompanying a donation to the Museum of a skin of the Burrhal Sheep from the Himalaya Mountains. The animal being quite new to the collection had been set up by Mr. Gould, and was placed in the room for exhibition. Mr. Bicheno writes as follows:

"I found the accompanying skin in the possession of a neighbouring gentleman, who left India last year; and as I apprehend it to belong to a rare animal, and hardly known in this country, I have, with his permission, sent it to the Museum of the Zoological Society. It is not possible for me, at this distance from authorities, to make it out satisfactorily, but it seems very near to the Asiatic Argal (*Ovis Argala*), if not identical; if so, however, it varies in many particulars from the descriptions given of that species.

"It was killed, June 1st, 1836, by Thos. Smith, Esq., 15th Native Infantry; known in India as one of the most intrepid sportsmen and best shots in the country. He met with it in the Great Snowy Range close to the Barinda Pass, communicating with Chinese Tartary, near also to the famous peak called Jaurnootrie, under which rises the river Tamna. He estimates the height at which he found the animal to have been from 15,000 to 17,000 feet: Humboldt, he thinks, calls the Berinda Pass 18,000 feet high.

"The hill-men call it Burrhal, and considered this specimen to have been seven years old by the horns. The cry was that of a tame sheep. It was exceedingly shy, and no animal in Mr. Smith's opinion is so difficult of approach. During his expedition in pursuit of the Burrhal he killed also the Thaar, which he took to be a species of Goat, and the 'Serow,' an Antelope, which Mr. Hodgson has described in the Journal of the Asiatic Society, No. 45, for Sept. 1835. The Thaar is also described in the same paper, and is regarded by him to be an Antelope. Mr. Hodgson suspects the Burrhal to be his *Ovis Nahoor*, but I have no opportunity of consulting the work."

An extract, forwarded by Mr. Bicheno, copied from the journal of Lieut. Thomas Smith, was also read, in which, after describing the great difficulty he found in reaching the district frequented by the Burrhal, he proceeds:

"I was at last repaid by seeing nine of them at about 600 yards, and they saw us. I attempted to get near, but no! they are without exception the most difficult animals in the world to get near; and the air being so rarified I could hardly breathe, my Paharrees constantly falling and declaring they *would* die, and begging me to return.

"About four o'clock, as I was just giving it up in despair, I suddenly came round a peak of snow, and found the large Ram at about 300 yards looking at me: despairing of ever getting nearer, and knowing my rifle would do it if only held straight, I beat a place in the snow and laid it along, taking a steady aim, pulled, and to my delight saw him fall on his side and kick. He recovered himself and crawled into some frightful rock, and there stood showing me his horns."

The animal was not eventually captured until it had received a large number of balls. "Thus I killed," says Lieut. Smith, "the first Burrhal ever killed by European or native that I can learn."

Mr. Ogilby observed that the present animal, although extremely rare and valuable, had been for some time known to naturalists, by a specimen in the collection of the Linnean Society, and by the researches of Mr. Hodgson, who had described two species of sheep inhabiting the Himalayan range. Recently, however, Mr. Hodgson had changed his opinion with respect to the existence of two distinct species, referring them both to his *Ovis Nahoor*; but Mr. Ogilby believed that another species did inhabit the Himalaya Mountains decidedly distinct from the present, and the horns of which are so capacious, that the young Foxes are said to nestle in such as are found unattached to the animals.

A paper was then read, entitled, "Observations on Marine Serpents." By Dr. Cantor.

This communication embodies the results of Dr. Cantor's observations upon the habits and general conformation of the Marine Ophidians, a group of *Vertebrata* to which but little attention has hitherto been given, from the circumstance of the danger attending their examination in the living state, and also from their geographical distribution being entirely confined to the tropical seas. The author being stationed, in the East India Company's service, on the Delta of the Ganges, had, during a considerable period, most favourable opportunities for studying these serpents, many of which were captured in the nets employed for fishing. His observations are principally directed to the anatomical characters which distinguish the marine from the terrestrial serpents, and to the modifications of structure by which the former are adapted to the element in which they exist. With respect to their physiology, the principal point of interest he establishes is, the circumstance of all the species, without exception, being highly venomous, a fact which has been denied by Schlegel, who states that the Marine Snakes are harmless; and the same erroneous idea is very current with the natives. Dr. Cantor in proof of the contrary refers to the recent death of an officer in Her Majesty's service, within an hour or two after the bite of a Serpent which had been caught at sea, and also to numerous experiments of his own, in which fowls, fish, and other animals invariably died within a few minutes after the bite had been inflicted. Numerous sketches were exhibited to the Meeting in illustration of Dr. Cantor's observations.

July 24, 1838.

Thomas Bell, Esq., in the Chair.

A letter, addressed to the Secretary, was read, from Walter Paton, Esq., accompanying a donation to the Museum of an Indian Fowl, remarkable for having had one of its spurs engrafted upon its head. The spur, in consequence of its removal to a part in which the supply of arterial blood was greatly increased, had grown to an unnatural size, and hung down in crescentic shape, presenting a very singular appearance.

Mr. Martin brought before the Meeting a collection of Snakes procured by the Euphrates Expedition, which, at the request of the Chairman, he proceeded to notice in detail.

The first, he observed, appeared to be referable to the *Coluber Cliffordii*; it agreed in every respect with specimens of that snake from Trebizond, procured by Keith Abbott, Esq., except that its colours were more obscure. Of this species there were several specimens, young and adult.

The others he regarded as new, and described them as follows:

Coluber Chesneii. This species is allied to *Col. Hippocrepis*, but differs in the shape of the muzzle, (which is more acute,) in the figure and extent of the nasal and labial plates, and in the disposition of the markings.

The labial plates are small and numerous, and in one specimen several are divided.

The posterior frontals are small, and in one specimen are divided into two.

The anterior frontals are contracted.

The superciliary plates are convex;—the eyes are small.

The scales of the trunk are small, imbricate, and without a keel.

The head is pale yellowish brown, the plates beautifully freckled or finely marbled with dark brown: a brown band traverses the superciliary and vertical plates from eye to eye, and then descends on each side obliquely to the angle of the mouth. The labial plates are bordered with dusky brown or deep gray.

The ground colour of the body above is yellowish brown; a series of square spots of a brown, or olive brown colour, extend from the back of the neck, above the median dorsal line, to the end of the tail. On the sides of the neck begins a line of the same colour, which soon breaks into elongated narrow marks, which towards the middle of the body become confused, broken, and irregular.

The superior margins of the abdominal plates are tinged with gray or dusky brown.

The whole of the under surface of head, body, and tail, pale yellow.

Caudal plates, 69 pairs in one specimen, and 57 in another.

	ft.	in.
Length of head and body	1	11
Length of tail	0	4¾

Coronella multicincta. Allied to the "Couleuvre à capuchon" but has the muzzle much shorter and rounder; it differs also in the distribution of the colours.

The head is broad, the eyes very small, the muzzle very short and blunt.

The head is gray, finely and closely marbled, and dotted with black; a ring of which colour encircles the neck. The ground colour of the trunk above is pale cinereous gray, barred with transverse marks of black, broadest in the middle, and having a disposition to assume the arrow-head form; they unite with the black of the abdomen alternately, so that their direction across the back is not directly transverse but obliquely so.

	ft.	in.
Length of head and body	1	1½
Length of tail	0	2½

Coronella modesta. Head small; muzzle short, but moderately pointed; eyes small. Scales of upper parts smooth and small; universal colour yellowish gray. A black band passes from eye to eye; a second crosses the *occiput*; and a third of a more decided tint encircles the back of the neck. In a specimen from Trebizond, procured by K. Abbot, Esq., the marks on the head are more obscure.

Length of head and body	9 inches,
Length of tail	2½

Coronella pulchra. Head long, flat, and pointed at the muzzle; eyes moderate.

Scales small and smooth.

General ground colour ashy gray; the head above beautifully marbled and mottled with black; an irregular mark crosses each superciliary plate and extends upon the vertical; and a mark of the same character traverses each occipital, and extends upon the sides of the occiput. A black mark runs below the eye to the margin of the lips, and a second to the angle of the mouth; a series of blackish spots begins on the back of the neck, and runs down the back, where they become larger, and often broken into a double alternating series; a line of smaller and deeper black spots runs along each side, and the upper margins of the abdominal plates also are irregularly mottled with black. The plates of the abdomen are minutely and obscurely freckled with dusky black.

	ft.	in.
Length of head and body	1	1½
Length of tail	0	3½

Vipera Euphratica. Allied to *Vipera elegans*, but differs in the disposition of the plates around and between the nostrils, and in the

style of its colouring. A large *fossa* indicates, as in *Vip. elegans*, the aperture of the nostrils, and within this a valve, only to be seen when the *fossa* is opened, stretches obliquely across, forming the posterior margin of the nasal canal, as it extends from the bottom of the *fossa*.

The rostral plate is large and rounded above; the muzzle is large and swollen; the eyes sunk, but are not overshadowed, as in *V. elegans*, by a single superciliary plate; the scales, however, which occupy its place, are somewhat larger than those covering the top of the skull between the eyes. A large elongated scale intervenes between the nasal cavity and the rostral plate. The scales between the nostrils are larger than those which succeed them; the labials are rather small, the fourth from the rostral being the largest—their number on each side is ten. The scales on the top of the head are small, keeled, subacute at the points; those of the trunk are large, flat, elongated, with rounded points, and narrowly keeled.

Subcaudal plates 47 pairs.

Body stout and robust, gradually tapering to the *apex* of the tail. The general colour of the upper surface is brownish gray, minutely freckled with black, the dots of which are more clustered on the sides, in some places, and at regular intervals, giving the appearance of obscure clouded *fasciæ*, or *nebulæ*. The plates of the under surface are pale yellow, obscurely mottled and dotted with dusky gray.

	ft.	in.
Length of head and body	4	5
Length of tail	0	7¼

Two other snakes, one from India, the other from Antigua, were also described as follows:

Coluber Cantori. Eyes large; head broad; muzzle moderate; vertical plate broad, as are also the two occipital plates, and the anterior ocular on each side. Scales of body small, smooth, and closely imbricate.

Body deep, somewhat compressed and tapering.

General colour of upper surface glossy brownish black; a black spot below each eye, on the meeting edges of the 5th and 6th labial plates; a black line from the back of the eye to the angle of the mouth, and a black band from the side of each occipital plate to the sides of the neck, where it ends abruptly.

Along the sides, for the anterior half of the body, a small whitish spot occurs at regular intervals, with a broad black spot below it; these marks become fainter and fainter, and at length disappear. The central line of the back, from the neck to the middle of the body, pale brown.

Abdomen yellowish white, becoming dusky as it proceeds; the posterior portion and the under surface of the tail being a little paler than the ground colour of the upper surface.

	ft.	in.
Length of head and body	1	1
Length of tail	0	3½

Mr. Martin observed that Dr. Cantor, in honor of whom he named this Snake, had observed it in India; and, according to the observations of this gentleman, it did not attain much larger dimensions than those of the specimen exhibited.

Inhabits India.

The exact locality of the specimen exhibited unknown.

HERPETODRYAS PUNCTIFER. Head narrow, scarcely distinct from the body; muzzle short and pointed; eyes small; body stout and gradually tapering. Scales smooth, short, broad, and imbricate.

General colour pale brown. A dark brown line runs down the top of the head; a riband of dark brown, made up of diamond-shaped marks joined together, commences at the occiput, and runs down the middle of the back to the end of the tail, on which last it is a simple line; a brown riband, little darker than the ground colour, but narrowly margined with dark brown, begins behind each eye, but soon loses itself on the sides of the body. Every scale at its *apex* has two minute dots of chalk-white, which, if not examined through a lens, might lead to the idea of their being the indications of pores; they are, however, simply round little dots of opake white. Plates of abdomen pale yellowish white, irregularly and obscurely marked with a dusky tint.

The specific term *punctifer* is given in allusion to the two white points at the apex of each scale.

Inhabits Antigua.

August 14, 1838.

William Yarrell, Esq., in the Chair.

A series of skins, belonging to species of the genus *Sciurus*, including, with one or two exceptions, all which are known to inhabit North America, were upon the table; and the Rev. Dr. Bachman, of S. Carolina, brought them severally before the notice of the Members. Six of the species exhibited were new, and for these he proposed the specific names of *Texianus*, *lanuginosus*, *fuliginosus*, *subauratus*, *Auduboni*, and *Richardsoni*. Dr. Bachman's manuscript notes upon the habits and characters of the North American Squirrels, with descriptions of the newly characterized species, were also laid before the Meeting.

The first species noticed by Dr. Bachman is the *Sciurus capistratus* of Bosc, or Fox Squirrel; *Vulpinus* of Gmel.; *niger*, Catesby; *variegatus*, Desm.; the Black Squirrel of Bartram. Its essential characters consist in its large size, in having the tail longer than the body, the hair coarse, and the ears and nose white. The dental formula is *inc.* $\frac{2}{2}$, *can.* $\frac{0-0}{0-0}$, *mol.* $\frac{4-4}{4-4}$. In a very young individual, supposed to have quitted the nest only a day or two, Dr. Bachman found an additional anterior grinder on each side in the upper jaw, but very minute. The additional molar teeth, he concludes, are shed at a very early period, as they were not present in two other specimens subsequently examined, and which were some days older than the former one. The Fox Squirrel is the largest found in the United States, and is subject to great differences of colour, but it still exhibits such striking and uniform markings, that the species may always be distinguished. Three principal varieties are noticed; in the first, which is the gray variety and the most common, the white of the nose extends to within four or five lines of the eyes; the ears, feet, and belly, are white; forehead and cheeks, brownish black; the hairs on the back are dark, plumbeous near the roots; then a broad line of cinereous; then black, and broadly tipped with white, with an occasional black hair interspersed, especially on the neck and fore-shoulder, giving the animal a light gray appearance; the hairs in the tail are for three-fourths of their length white from the roots, then a ring of black, with the tips white. This is the variety given by Bosc and other authors as *Sc. capistratus*.

The second variety (the Black Fox Squirrel) has the nose and ears white, a few light-coloured hairs on the feet, the rest of the body and tail black; there are, occasionally, a few white hairs in the tail. This is the original black squirrel of Catesby and Bartram, (*Sc. niger*).

In the third variety, the nose, mouth, under-jaw, and ears, are

white; head, thighs, and belly, black; the back and tail, dark-gray. This is the variety alluded to by Desmarest, *Ency. Méthod. Mammalogie*, p. 333.

A fourth variety, very common in Alabama, and also occasionally seen in the upper districts of South Carolina, and which has, on several occasions, been sent to Dr. Bachman as a distinct species, has the ears and nose white, a prominent mark in all the varieties, and by which the species may be easily distinguished. The head and neck are black; back, rusty-blackish brown; neck, thighs, and belly, bright rust colour; tail annulated with black and red. This is the variety erroneously considered by the author of the notes on MacMurtius' translation of Cuvier, (Append. vol. i. p. 433.) as the *Sciurus rufiventer*.

The three first varieties noted above, Dr. Bachman describes as being common in the lower and middle districts of South Carolina; and although they are known to breed together, yet it is very rare to find any specimens indicating an intermediate variety. Where the parents are both black, the young are invariably of the same colour; the same may be said of the other varieties; where, on the other hand, there is one parent of each colour, an almost equal proportion of the young are of the colour of the male, the other of the female. On three occasions he had opportunities of examining the young produced by progenitors of different colours. The first nest contained four, two black and two gray; the second, one black and two gray; and the third, three black and two gray. The colour of the young did not, in a majority of instances, correspond with that of the parent of the same sex. Although the male parent was black, the young males were frequently gray, and *vice versâ*.

Dimensions of the Fox Squirrel.

	in.	lines.
Length of head and body	14	5
Tail (to end of vertebræ)	12	4
Tail to the tip	15	2
Palm and middle fore-claw	1	9
Sole and middle hind-claw	2	11
Length of fur on the back.		8
Height of ear posteriorly		7

This species is said to exist sparingly in New Jersey: Dr. Bachman has not observed it further north than Virginia, nor could he find it in the mountainous districts of that state. In the pine forests of North Carolina it becomes more common; in the middle and maritime districts of South Carolina it is almost daily met with, although it cannot be said to be an abundant species anywhere.

Sciurus Texianus. Texian Squirrel. This name is proposed by Dr. Bachman for an apparently undescribed species which he saw in the Museum at Paris. It was said to have been received from Mexico. In the Museums of Berlin and Zurich, he also found what

he conceives to be the same species; and in the British Museum there is a specimen obtained at Texas by Mr. Douglas, agreeing with the others in almost every particular. Dr. Bachman also states that, among his notes there is a description of a specimen received by a friend from the south-western parts of Louisiana, which, on a comparison with memoranda taken from the other specimens, does not appear to differ in any important particular. Hence, he thinks it probable that this species has a tolerably extensive range extending perhaps from the south-western portions of Louisiana, through Texas, into Mexico.

The Texian Squirrel is about the size of the Fox Squirrel. On the upper surface there is a mixture of black and yellow, and on the under parts deep yellow. The under sides of the limbs, and also the parts of the body contiguous, are whitish. Fore-legs externally, and the feet, rich yellow: ears, on both surfaces, yellow, with interspersed white hairs: nose and lips, brownish white: hairs of tail, rich rusty yellow at base, with a broad black space near the extremity, and finally tipt with yellow.

Dimensions.	m.	lines.
Length of body	13	6
Tail to end of hair	15	0
Tarsus	3	0
Height of ears to end of fur	0	$6\frac{1}{2}$

The Texian Squirrel bears some resemblance to the *Sciurus capistratus*. The latter species, however, in all the varieties hitherto examined by Dr. Bachman, has uniformly the white ears and nose.

This species would appear to replace the *Capistratus* in the south-western parts of America.

SCIURUS SUBAURATUS. *Sci. corpore suprà cinereo, flavo lavato, infrà austerè aureo, caudâ corpore longiore. Dentes, inc.* $\frac{2}{2}$, *mol.* $\frac{4-4}{4-4}$.

The designation "Golden-bellied Squirrel," and the specific term *subauratus*, are given by Dr. Bachman to a species, of which two dead specimens were procured in the markets of New Orleans by Mr. Audubon. Their size was between that of the Northern Gray, and the Little Carolina Squirrel. There was no trace of the small anterior upper molar generally found in the species of the genus *Sciurus*. The upper incisors are of a deep orange brown colour, and of moderate size: under incisors a little paler than the upper; the head is of moderate size; whiskers longer than the head; the ears are short and pointed, and clothed with hair on both surfaces. The body seems better formed for agility than that of the small Carolina, in this respect approaching nearer to the Northern Gray Squirrel. The tail is broad and nearly as long as that of the last-named species.

The colour of the whole upper surface is gray, with a distinct yellow tint. The hairs, which give this outward appearance, are grayish slate colour at their base, then very broadly annulated with

yellow; then black, and near the apex annulated with yellowish white. The sides of the face and neck, the whole of the inner side of the limbs, feet, and the whole of the under parts, of a deep golden yellow; on the cheeks and sides of the neck, however, the hairs are obscurely annulated with black and whitish; the ears are well clothed on both surfaces with tolerably long hairs of the same deep golden hue as the sides of the face; hairs of the feet are mostly blackish at the root, and some are obscurely tipped with black; hairs of the tail black at the roots, and the remaining portion of a bright rusty yellow; each hair three times in its length annulated with black; the under surface of the tail is chiefly bright rusty yellow; whiskers longer than the head, black.

Dimensions.	in.	lin.
Length of head and body	10	6
Tail (*vertebræ*)	9	2
Tail including fur	12	0
Palm to end of middle fore-claw	1	7
Length of heel to point of middle nail	2	6
Height of ear posteriorly	0	5
Length of fur on the back	0	7
Breadth of tail with hair extended	8	6

Weight, one pound and a quarter.

Sciurus magnicaudatus, Harlan's Fauna, p. 170. *S. macrourus*, Say. Long's Expedition, vol. i. p. 115.

Of this species Dr. Bachman remarks, that although he has seen many specimens labelled under the above name, yet the only true *S. macrourus* which has come under his own observation, is one in the Philadelphia Museum. Not being in possession of his own memoranda upon this species, he quotes the description published by Say.

Sciurus aureogaster, F. Cuv. et Geoff. Mamm Californian Squirrel.

Dr. Bachman's acquaintance with this species rests upon the examination of some specimens in the Museum of the Zoological Society, from which he draws up the following description.

The general hue above is deep gray, grizzled with yellow: the under parts and inner side of the limbs are deep rusty red; chin, throat, and cheeks, pale gray. Limbs externally, and feet, coloured as the body above. Hairs on the toes chiefly dirty white. Tail large and very bushy. Hairs of the tail black, twice annulated with dirty yellow, and broadly tipped with white—the white very conspicuous where the hairs are in their natural position. Ears thickly clothed, chiefly with blackish hairs, the hinder basal part, externally, with long white hairs extending slightly on the neck. All the hairs of the body are gray at the base, those of the upper parts annulated first with yellow, then black, and then white. Whiskers black, the hairs very long and bristly. The under incisors almost as deep an orange colour as the upper.

Habitat Mexico and California.

Dimensions.	in.	lin.
From nose to root of tail	12	0
Tail to end of hair	10	6
Heel to end of claws	2	$5\frac{1}{2}$
Nose to ear	2	$1\frac{1}{2}$
Height of ear posteriorly	0	$7\frac{1}{2}$

A second specimen, the locality of which was not given, differed from the above in having a much richer colouring. The belly was of a very bright rust colour. The hairs on the tail were black at the roots, then broadly annulated with rusty yellow, then a considerable space occupied by black, the apical portion white, but when viewed from beneath, a bright rust colour like that of the belly was very conspicuous, occupying the basal half of the hair. The upper parts of the body were grizzled with black and white, and many of the hairs were annulated with rust colour. Over the haunches and rump, the hairs are annulated with rusty yellow and black. The hairs of the feet were chiefly black.

The original specimen on which this species was founded, is in the Museum at Paris, and Dr. Bachman quotes the following description from Mr. Waterhouse's manuscript notes.

"General colour, grizzled black and white. Throat, chest, belly, innerside of legs, nearly the whole of the fore-legs, and the forepart of the hind-legs, rusty red. Tail very broad; the hairs black; red at the base, and white at the apex; lips white; feet black, with a few white hairs intermixed; forepart of head also black, with scattered white hairs. Chin blackish in front, shading towards the throat into gray."

	in.	lin.
Nose to root of tail	11	6
Tail to end of hair	11	0
Tarsus	2	$4\frac{1}{3}$

Sciurus cinereus. Gmel. Cat Squirrel, Pen. Arct. Zool. i. 137.

A little smaller than the Fox Squirrel; larger than the Northern Gray Squirrel; body stout, legs rather short; nose and ears not white; tail longer than the body. Dental formula, *incis.* $\frac{2}{2}$, *can.* $\frac{0-0}{0-0}$, *mol.* $\frac{4-4}{4-4}$, =20.

Of this species Dr. Bachman remarks, "It has sometimes been confounded with the Fox Squirrel, and at other times with the Northern Gray Squirrel. It is, however, in size intermediate between the two, and has some distinctive marks by which it may always be known from either. The Northern Gray Squirrel has, as far as I have been able to ascertain from an examination of many specimens, permanently five grinders in each upper jaw, and the present species has but four. Whether at a very early age the Cat Squirrel may not, like the young Fox Squirrel, have a small deciduous tooth, I have had no means of ascertaining; all the specimens before me, having been obtained in autumn or winter and being adults, present the dental formula as given above. The Fox Squirrel is permanently marked with white ears and nose, which is not the

case with the Cat Squirrel; the former is a southern species, the latter is found in the middle and northern states.

"The head is less elongated than that of the Fox Squirrel; nose more obtuse; incisors rather narrower, shorter, and less prominent; the molars, with the exception of their being a little smaller, bear a strong resemblance to, and are arranged in a similar manner to those of the former species. The neck is short; legs short and stout; nails narrower at base than those of the Fox Squirrel; shorter and less arched; the tail also is shorter and less distichous; the body is shorter and thicker, and the whole animal has a heavy, clumsy appearance. The fur is not as soft as that of the Northern Gray Squirrel, but finer than that of the Fox Squirrel.

"This species, as well as the last, is subject to great varieties of colour. I have observed in Peale's Museum specimens of every shade of colour, from light gray to nearly black. I have also seen two in cages which were nearly white, but without the red eyes, which is a characteristic mark in the Albino. There appears, however, to be this difference between the varieties of the present species and those of the Fox Squirrel; the latter are permanent varieties, scarcely any specimens being found in intermediate colours; in the present there is every shade of colour, scarcely two being found precisely alike.

"The most common variety, however, is the Gray Cat Squirrel, which I shall describe from a specimen now before me.

"Teeth orange; nails dark brown near the base, lighter at the extremities. On the cheeks there is a slight tinge of yellowish brown, and this colour is extended to the neck; the inner surface of the ears is also of the same colour; the fur on the outer surface of the ear, which extends a little beyond the outer edge and is of a soft woolly appearance, is light cinereous, and on the edge of the ear, rusty brown. Whiskers black and white, the former colour predominating. Under the throat, the inner surface of the legs and thighs, and the whole under surface, white. On the back the hairs are dark cinereous near the roots, then light ash, then annulated with black and at the tip white, giving to the fur an iron-gray appearance. The tail, which does not present the flat distichous appearance of the majority of the other species, but is more rounded and narrower, is composed of hairs which, separately examined, are of a soiled white tint near the roots, then a narrow marking of black, then white, then a broad line of black, and finally broadly edged with white.

"Another specimen is dark gray on the back and head, and a mixture of black and cinereous on the feet, thighs, and under surface. Whiskers nearly all white. The markings on the tail are similar to those of the other specimen.

Dimensions.	in.	lin.
Length of head and body	11	3
Tail (vertebræ)	9	6
Tail to the end of the hair	12	6

Dimensions.	in.	lin.
Height of ear posteriorly	0	6
Palm and middle fore-claw	1	6
Heel and middle hind-claw	2	9
Length of fur on the back.....	0	7

"This has been to me a rare species. It is said to be common in the oak and hickory woods of Pennsylvania, and I have occasionally met with it near Easton and York. I also observed one in the hands of a gunner near Fredericksburg, Virginia. In the northern part of New York it is exceedingly rare, as I only saw two pair during fifteen years of close observation. In the lower part of that state, however, it appears to be more common, as I recently received several specimens procured in the county of Orange.

"This squirrel has many habits in common with other species, residing in the hollows of trees, building in summer its nest of leaves in some convenient crutch, and subsisting on the same variety of food. It is, however, the most inactive of all our known species. It mounts a tree, not with the lightness and agility of the Northern Gray Squirrel, but with the slowness and apparent reluctance of the little Striped Squirrel (*Tamias Lysteri*). After ascending, it does not mount to the top, as is the case with other species, but clings to the body of the tree on the side opposite to you, or tries to conceal itself behind the first convenient limb. I have never observed it escaping from branch to branch. When it is induced in search of food to proceed to the extremity of a limb, it moves cautiously and heavily, and returns the same way. On the ground it runs clumsily and makes slower progress than the Gray Squirrel. It is usually fat, especially in autumn, and the flesh is said to be preferable to that of any other of our species.

"The Cat Squirrel does not appear to be migratory in its habits. The same pair, if undisturbed, may be found taking up their residence in a particular vicinity for a number of years in succession, and the sexes seem mated for life."

Sciurus leucotis. Northern Gray Squirrel.

Gray Squirrel. Penn. Arct. Zool. vol. i. p. 135. Hist. Quad. No. 272.

Sci. Carolinensis. Godman non Gmel.

Sci. leucotis. Gapper, Zoological Journal, vol. v. p. 206, published in 1830.

Larger than the Carolina Gray Squirrel; tail much longer than the body; smaller than the Cat Squirrel; subject to many varieties of colour.

Dental formula, *incis.* $\frac{2}{2}$, *mol.* $\frac{5-5}{4-4}$, 22.

Dr. Bachman states, that this species, which is very common in the northern and middle states, has hitherto been improperly confounded with the Carolina Gray Squirrel. It appears to have the additional anterior *molares* permanent, in this particular agreeing

with several other American Squirrels. The fact, that many of them have only $\frac{4-4}{4-4}$, he alludes to as indicating the necessity for modifying the dental formula hitherto assigned to the genus *Sciurus*.

The incisors are strong and compressed, a little smaller than those of the Cat Squirrel, convex, and of a deep orange colour anteriorly; the upper ones have a sharp cutting edge, and are chisel-shaped; the lower are much longer and thinner. The anterior grinder, although round and small, is as long as the second; the remaining four grinders are considerably more excavated than those of the Cat Squirrel, presenting two transverse ridges of enamel. The lower grinders corresponding to those above have also elevated crowns. The hair is a little softer than that of the Cat Squirrel, and is most harsh on the forehead.

The nose is rather obtuse; forehead arched; whiskers as long as the head; ears somewhat rounded, concave; both sides of the ear covered with hair, that which clothes the outside being much the longest. In winter the fur projects upwards, about three lines beyond the margin.

Dr. Bachman observes, that although this species exists under many varieties, there appear to be two very permanent ones. These are,

1. Gray variety. The nose, cheek, around the eyes, extending to the insertion of the neck, the upper surface of the fore and hind feet, and a stripe along the sides, yellowish brown. The ears on their posterior surface are dirty white, edged with brown. On the back from the shoulder there is an obscure stripe of brown, broadest at its commencement, and running down to a point at the insertion of the tail. In a few specimens this stripe is wanting. On the neck, sides of the body, and hips, the colour is light gray; the hairs separately are for one half their length dark cinereous, then light umber, then a narrow mark of black and tipped with white; a considerable number of black hairs are interspersed, giving it above a gray colour; the hairs in the tail are light yellowish brown from the roots, with three stripes of black, the outer one being widest, and broadly tipped with white; the whole under surface is white.

"There are other specimens where the yellowish markings on the sides and feet are altogether wanting. Dr. Godman (vol. ii. p. 133.) asserts that the golden colour on the hind feet is a very permanent mark. The specimens from Pennsylvania in my possession have generally this peculiarity, but many of those from New York and New England have gray feet, without the slightest mixture of yellow."

2. Black variety. This variety, on several occasions, Dr. Bachman has seen taken from the same nest with the Gray Squirrel. It is of the size and form of the gray variety. It is dark brownish black on the whole of the upper surface, a little lighter beneath. In summer its colour is less black than in winter. The hairs of the back and sides of the body and tail are obscurely grizzled with yellow.

Dimensions of the Northern Gray Squirrel.

	in.	lin.
Length of head and body	11	9
Tail (vertebræ)	10	0
Tail to the tip	13	0
Height of ear	0	7
Height to the end of fur	0	9
Palm to end of middle claw	1	10
Heel to end of middle nail	2	6
Length of fur on the back	0	7
Breadth of tail with hairs extended ..	4	2

As regards its geographical distribution, the northern limit of this species is not determined; it however exists as far as Hudson's Bay; was formerly very common in the New England States, and in the less cultivated portions is still frequently met with. It is abundant in New York and the mountainous portions of Pennsylvania. Dr. Bachman has observed it on the northern mountains of Virginia; it probably extends still further south: in the lower parts of North and South Carolina, however, it is replaced by a smaller species. The black variety is more abundant in Upper Canada, in the western part of New York, and in the States of Ohio and Indiana. The Northern Gray Squirrel does not exist in Georgia, Florida, or Alabama; and among specimens of Squirrels sent from Louisiana, stated to be all the species existing in that State, he did not discover the present species.

In its habits Dr. Bachman describes the *Sc. leucotis* as one of the most active species of Squirrel existing in the United States. It rises with the sun, and continues industriously engaged in search of food during four or five hours in the morning. In the middle of the day it retires for a few hours to its nest, and then resumes its labours till sunset. In the warm weather of spring and summer it builds a temporary residence in the crutch of some tree, or in the fork of some large branch. A pair of squirrels are employed on this nest, which is formed of dry sticks and twigs, and lined with moss. In the winter months these squirrels reside together in the hollows of trees, and there the female brings forth her progeny. No instance has come under Dr. Bachman's observation of their breeding in a state of domestication.

During the rutting season the males engage in frequent contests, and often wound each other severely. The very current notion that they emasculate one another in these encounters, is supposed by Dr. Bachman to have originated in the circumstance of the *testes* diminishing in bulk at a certain period of the year, or in these organs being retracted within the *pelvis*.

The food of the Northern Gray Squirrel is like that of the species in general, nuts, seed, and grain; it gives, however, the preference to the several kinds of hickory. Its fondness for the green corn and young wheat renders it very obnoxious to the farmer, and various

inducements are consequently held out for their destruction. In Pennsylvania an ancient law existed, offering three pence a head for every one destroyed; and in this way, in the year 1749, the sum of eight thousand pounds was paid out of the treasury in premiums.

It is this species of Squirrel which occasionally migrates in such vast bodies, but instances of this nature are of much rarer occurrence now than formerly. Autumn is the season of the year at which the migration takes place, and they instinctively direct their course in an eastward direction. Dr. Bachman states that he once witnessed a body of them in the act of migrating, and saw them cross the Hudson in various places between Waterford and Saratoga. They swam deep and awkwardly, with the body and tail entirely submerged. Many were drowned in the passage, and those which reached the opposite bank were so exhausted, that the boy stationed there had no difficulty in killing them or taking them alive.

Sciurus Carolinensis, Gmel. Little Carolina Gray Squirrel.

This species is smaller than the Northern Gray Squirrel, and has the tail, which is the same length as its body, narrower than in that species. The colour above is rusty gray, beneath white, and not subject to variation.

The head is shorter, and the space between the ears proportionally broader than those of the Northern Gray Squirrel; the nose also is sharper; the small anterior molar in the upper jaw is permanent, being invariably found in all the specimens examined by Dr. Bachman; and is considerably larger than in the other species. All his specimens, which give evidence of the animals having been more than a year old, instead of having the small thread-like single tooth as in the northern species, have a distinct double tooth with a double crown; the other molars are not unlike those of the other species in form, but are shorter and smaller; the upper incisors are nearly a third shorter. The body is shorter, less elegant in shape, and has not the appearance of sprightliness and agility for which the other species is so eminently distinguished. The ears, which are nearly triangular in shape, are so slightly clothed with hair internally, that they may be said to be nearly naked; externally, they are sparely clothed with short woolly hair, which does not, however, extend beyond the margins, as in the other species; the nails are shorter and less hooked; the tail is shorter, and does not present the broad distichous appearance of the other. Teeth light orange colour; nails brown, lighter at the extremities; whiskers black; nose, cheeks, and around the eyes, with a slight tinge of rufous gray. The fur on the back is for three-fourths of its length dark plumbeous, then a slight marking of black, edged with brown in some hairs, and black in others, giving it on the whole upper surface an uniform dark ochreous colour. In a few specimens there is an obscure line of lighter brown along the sides, where the ochreous colour prevails, and a tinge of the same colour on the upper

surface of the fore-legs above the knees. The feet are light gray; the hairs of the tail are, for three-fourths of their length from the roots, yellowish brown; then black, edged with white; the throat, inner surface of the legs and the belly, white.

Dimensions.	in.	lin.
Length of head and body	9	6
Tail (vertebræ)	7	4
Tail to point of hair	9	6
Height of ear	0	6
Palm to end of middle claw	1	3
Heel to end of middle nail	2	6
Length of fur on the back	0	5
Breadth of tail with hairs extended	3	0

Dr. Bachman remarks that the present species has long been confounded with the Northern Gray Squirrel, but that any naturalist who has had an opportunity of comparing many specimens of both, and of witnessing their natural habits, cannot fail to regard them as distinct species. Specimens of the former, which he had received from North Carolina, Alabama, Florida, and Louisiana, scarcely presented a shade of difference when placed beside those of South Carolina; whilst in the Northern Gray Squirrel the great variations in colour form a prominent characteristic distinction.

As regards the geographical range of the Carolina Squirrel, Dr. Bachman states it to be abundant in South Carolina, Alabama, Mississippi, and Georgia, especially in low grounds or swampy localities; it is the only known species in the southern peninsula of East Florida, and it also occurs, though not abundantly, in Louisiana. Dr. Bachman has received it from North Carolina, and believes that he has seen the species in the southern part of New Jersey. Its habits he describes as very different from those of the Northern Gray Squirrel: its bark is less full, but much shriller and more querulous. Instead of mounting high on the trees when alarmed, it clings round the trunk on the opposite side, and hides itself under the Spanish mosses which are trailing around the trees. It is much less wild, and consequently more readily captured than the northern species. Its favourite haunts are low swampy situations, and amongst the trees which overhang the streams and borders of the rivers: its nest is composed of leaves and Spanish moss, and is generally placed in the hollow of some cypress. In one respect, it differs from all the other species of the genus, in being, to a certain extent, nocturnal in its habits. Dr. Bachman has frequently observed it by moonlight as actively engaged as the Flying Squirrel; and the traveller, after sunset, in riding through the woods, is often startled by its noise.

Sciurus Colliæi. For a description of this species, of which the original specimen is in the Collection of the Zoological Society, Dr. Bachman refers to Dr. Richardson's Appendix to Capt. Beechey's Voyage.

Sciurus nigrescens. A species described by Mr. Bennett, in the Proceedings of the Zool. Soc. for 1833, p. 41.

Sciurus niger, Linn. non Catesby. The Black Squirrel.

A little larger than the Northern Gray Squirrel; fur soft and glossy. Ears, nose, and the whole body, pure black; a few white tufts of hair interspersed. Incis. $\frac{2}{2}$, canines $\frac{0-0}{0-0}$, molars $\frac{4-4}{4-4}$, =20.

Of this species Dr. Bachman remarks, "Much confusion has existed with regard to this species. The original *Sciurus niger* of Catesby is the black variety of the Fox Squirrel. It is difficult to decide, from the descriptions of Drs. Harlan and Godman, whether they refer to specimens of the black variety of the Northern Gray Squirrel, or to the species which I am about to describe. Indeed, there is so strong a similarity, that I have admitted it as a species with some doubt and hesitation. Dr. Richardson has, under the head of *Sciurus niger*, (see Fauna Boreali-Americana, p. 191.) described a specimen from Lake Superior, of what I conceive to be the black variety of the Gray Squirrel; but at the close of the same article (p. 192.), he has described another specimen from Fort William, which answers to the description of the specimens now before me. There is great difficulty in finding suitable characters by which the majority of our species of Squirrel can be designated, but in none greater than in the present. All our naturalists seem to insist that we have a *Sciurus niger*, although they have applied the name to the black varieties of several species. As the name, however, is likely to continue on our books, and as the specimens before me, if they do not establish a true species, will show a very permanent variety, I shall describe them under the above name.

"Dr. Godman states (Nat. Hist. vol. ii. p. 133.) that the Black Squirrel has only twenty teeth; the specimens before me have no greater number, with the exception of one, evidently a young animal a few months old, which has an additional tooth on one side, so small that it appears like a white thread, the opposite and corresponding one having already been shed. If further examinations will go to establish the fact that this additional molar in the Northern Gray Squirrel is persistent, and that of the present deciduous, there can be no doubt of their being distinct species. Its head appears to be a little shorter and more arched than that of the Gray Squirrel, although it is often found that these differences exist among different individuals of the same species. The incisors are compressed, strong, and of a deep orange colour anteriorly. Ears, elliptical and slightly rounded at tip, thickly clothed with fur on both surfaces, that on the outer surfaces, in a winter specimen, extending three lines beyond the margins; there are, however, no distinct tufts. Whiskers a little longer than the head. Tail long and distichous, thickly clothed with moderately coarse hair.

"The fur is softer to the touch than that of the Northern Gray Squirrel. The whole of the upper and lower surface, as well as the tail, are bright glossy black; at the roots the hairs are a little lighter. The summer fur does not differ materially from that of the

winter, it is however not quite so intensely black. In all the specimens I have had an opportunity of examining, there are small tufts of white hairs irregularly situated on the under surface, resembling those on the body of the Mink (*Mustela vison*). There are also a few scattered white hairs on the back and tail.

Dimensions.	in.	lin.
Length of head and body	13	0
Tail (vertebræ)	9	1
Tail including the fur	13	0
Palm to end of middle fore-claw	1	7
Length of heel to the point of middle claw	2	7
Length of fur on the back	0	8
Breadth of tail with hair extended	5	0

"The specimens from which this description has been taken were procured, through the kindness of friends, in the counties of Rensellaer and Queens, New York. I have seen it on the borders of Lake Champlain, at Ogdensburg, and on the eastern shores of Lake Erie; also near Niagara on the Canada side. The individual described by Dr. Richardson, and which may be clearly referred to this species, was obtained by Capt. Bayfield at Fort William, on Lake Superior. Black squirrels exist through all our western wilds, and to the northward of the great lakes, but whether they are of this species, or of the black variety of the Gray Squirrel, I have not had the means of deciding."

Dr. Bachman had for several successive summers an opportunity of studying the habits of this species in the northern parts of the United States. It seems to prefer valleys and swamps to dryer and more elevated situations, and to possess all the sprightliness of the Northern Gray Squirrel. A colony of them had taken up their abode by the side of a retired rivulet, where they were closely and frequently watched by Dr. Bachman. He remarked that when drinking they did not lap, but protruded the mouth a considerable way under the surface of the water: supported upon the tail and *tarsi*, they would remain for a quarter of an hour wiping their faces with their paws; when alarmed, their favourite place of retreat was a large white pine tree, (*Pinus strobus*): their bark and general habits did not differ much from those of the Northern Gray Squirrel.

Sciurus Auduboni. Larger Louisiana Black Squirrel.

Sciurus corpore suprà nigro, subtùs fuscescente; caudâ corpus longitudine æquante.

A new species, for which Dr. Bachman is indebted to Mr. Audubon. It has the fur very harsh to the touch, and is rather less in size than the *Sciurus niger*.

Sciurus fuliginosus. Sooty Squirrel.

Sciurus corpore suprà nigro et fuscescenti-flavo irrorato, subtùs fuscescente; caudâ corpore valdè longiore: dentes inc. $\frac{2}{2}$, *mol.* $\frac{5-5}{4-4}$.

Dr. Bachman remarks of this species, " I am indebted to J. W. Audubon, Esq., for a specimen of an interesting little Squirrel obtained at New Orleans on the 24th March, 1837, which I find agreeing in most particulars with the specimen in the Philadelphia Museum, referred by American authors to *Sciurus rufiventer*.

" Dr. Harlan's description does not apply very closely to the specimen in question, but seems to be with slight variations that of Desmarest's description of *Sciurus rufiventer*.

" The following description is taken from the specimen procured by Mr. Audubon. It was that of an old female, containing several young, and I am enabled to state with certainty that it was an adult animal.

" I have given to this species the character of 22 teeth, from the circumstance of my having found that number in the specimen from which I described. The animal could not have been less than a year old. The anterior molars in the upper jaw are small; the inner surface of the upper grinders is obtuse, and the two outer points on each tooth are elevated and sharper than those of most other species. In the lower jaw the molars regularly increase in size from the first, which is the smallest, to the fourth, which is the largest. Head short and broad; nose very obtuse; ears short and rounded, slightly clothed with hair; feet and claws rather short and strong; tail short and flattened, but not broad, resembling that of the *Sc. Hudsonius*. The form of the body, like that of the little Carolina Squirrel, is more indicative of strength than of agility.

" The hairs on the upper part of the body, the limbs externally and feet, are black, obscurely grizzled with brownish yellow. On the under parts, with the exception of the chin and throat, which are grayish, the hairs are annulated with brownish orange and black, and a grayish white at the roots. The prevailing colour of the tail above is black, the hairs however are brown at base and some of them are obscurely annulated with brown, and at the apex pale brown. On the under side of the tail the hairs exhibit pale yellowish brown annulations.

Dimensions.	m.	lines
Length of head and body	10	0
Tail (vertebræ)	6	9
Do. including fur	8	6
Fore foot to point of middle fore-claw	1	8
Hinder foot to point of longest nail	2	1
Height of ear posteriorly	0	4
Length of fur on the back	0	7

Weight without intestines, $\frac{3}{4}$ lb.

" I am under an impression that this little species is subject to some variations in colour, the present specimen and that in the Philadelphia Museum having a shade of difference, the latter appearing a little lighter. In Louisiana it is so dark in colour as to be familiarly called by the French inhabitants, ' Le petit noir.' This Little Black Squirrel is an inhabitant of low swampy situations

along the Mississippi, and is said to be abundant in its favourite localities.

"As yet I am unacquainted with any species of Squirrel fully agreeing with *Sc. rufiventer*."

Sciurus Douglasii, Gray. *Oppoce-poce*, Indian name.

A species about one-fourth larger than the Hudson's Bay Squirrel; tail shorter than the body. Colour: dark brown above, and bright buff beneath. Dental formula; *incis.* $\frac{2}{2}$, *can.* $\frac{0-0}{0-0}$, *mol.* $\frac{4-4}{4-4}$, = 20.

The incisors are a little smaller than those of *Sc. Hudsonius*. In the upper jaw, the anterior molar, which is the smallest, has a single rounded eminence on the inner side; on the outer edge of the tooth there are two acute points, and one in front; the next two grinders, which are of equal size, have each a similar eminence on the inner side, with a pair of points externally; the posterior grinder, although larger, is not unlike the anterior one. In the lower jaw the bounding ridge of enamel in each tooth forms an anterior and posterior pair of points. The molars increase gradually in size, from the first, which is the smallest, to the posterior one, which is the largest.

This species in the form of its body is not very unlike the *Sc. Hudsonius*; its ears and tail, however, are much shorter in proportion. In other respects also, as well as in size, it differs widely.

Head considerably broader than that of *Sc. Hudsonius*; nose less elongated and blunter; body long and slender; ears rather small, nearly rounded, slightly tufted posteriorly; as usual in this genus, the third inner toe is the longest, and not the second, as in the *Spermophiles*. The whiskers, which are longer than the head, are black. The fur, which is soft and lustrous, is on the back, from the roots to near the points, plumbeous, and at the tip brownish gray; a few lighter coloured hairs interspersed, gives it a dark brown tint: when closely examined it has the appearance of being thickly sprinkled with minute points of rust colour on a black ground. The tail, which is distichous but not broad, is for three-fourths of its length of the colour of the back; in the middle the hairs are plumbeous at the roots, then irregular markings of brown and black, and tipped with soiled white, giving it a hoary appearance; on the extremity of the tail the hairs are black from the roots, tipped with light brown. The inner sides of the extremities and the outer surfaces of the feet, together with the throat and mouth, and a line above and under the eye, are bright buff.

The colours on the upper and under parts are separated by a line of black, commencing at the shoulders and running along the flanks to the thighs. It is widest in the middle, where it is about three lines in width, and the hairs, which project beyond the outer margins of the ears, and form a slight tuft, are dark brown, and in some specimens black.

Dimensions.	in.	lines.
Length from point of nose to the insertion of the tail	8	4
Tail (vertebræ)	4	6
Tail including fur	6	4

Dimensions.	in.	lines.
Height of ear posteriorly	0	6
Palm to end of middle fore-claw	1	4
Heel and middle hind-claw	1	10

Sciurus Hudsonius, (Pennant). The Chickaree Hudson's Bay Squirrel. Red Squirrel.

Common Squirrel. Foster, Phil. Trans., vol. 62, p. 378, an. 1772.

Sciurus vulgaris, var. E. Erxleben Syst., an. 1777.

Hudson's Bay Squirrel. Penn. Arct. Zool., vol. 1. p. 116.

Common Squirrel. Hearne's Journey, p. 385.

Red Barking Squirrel. Schoolcraft's Journal, p. 273.

Red Squirrel. Warden's United States, vol. i. p. 330.

Ecureuil de la Baie d'Hudson. F. Cuvier, Hist. Nat. de Mam.

Sc. Hudsonicus. Harlan. Godman.

The Hudson's Bay Squirrel, a well-known species, is a third smaller than the Northern Gray Squirrel; tail shorter than the body; ears slightly tufted. Colour, reddish above, white beneath.

Dental formula: *incis.* $\frac{2}{2}$, *can.* $\frac{0-0}{0-0}$, *mol.* $\frac{4-4}{4-4}$, = 20.

Sciurus Richardsoni. Columbia Pine Squirrel.

Small Brown Squirrel. Lewis and Clarke, vol. iii. p. 37.

Sciurus Hudsonius, var. β. Columbia Pine Squirrel. Richardson, Fauna Boreali-Americana, p. 190.

Smaller than *Sc. Hudsonius*; tail shorter than the body; rusty gray above, whitish beneath; extremity of the tail black.

This small species was first noticed by Lewis and Clarke, who deposited a specimen in the Philadelphia Museum, where it still exists. I have compared it with the specimen brought by Dr. Townsend, and find them identical. Dr. Richardson, who appears not to have seen it, supposes it to be a mere variety of the *Sciurus Hudsonius*. On the contrary, Dr. Townsend says in his Notes, "It is evidently a distinct species; its habits being very different from those of the *Sciurus Hudsonius*. It frequents the pine-trees in the high range of the rocky mountains west of the great chain, feeding upon the seeds contained in the cones. These seeds are large and white, and contain much nutriment. The Indians eat a great quantity of them, and esteem them good. The note of this squirrel is a loud jarring chatter, very different from the noise of *Sc. Hudsonius*. It is not at all shy, frequently coming down to the foot of the tree to reconnoitre the passenger, and scolding at him vociferously. It is, I think, a scarce species."

The difference between these two species can be detected at a glance by comparing the specimens. The present species, in addition to its being a fourth smaller and about the size of the *Tamias Lysteri*, has less of the reddish brown on the upper surface, and may always be distinguished from the other by the blackness of its tail at the extremity, as also by the colour of the incisors, which are nearly white, instead of the deep orange of the *Hudsonius*.

The upper incisors are small and of a light yellow colour; the

lower are very thin and slender, and nearly white. The first, or deciduous, grinder, as in all the smaller species of Pine Squirrels that I have examined, is wanting; the remaining grinders, both in the upper and lower jaw, do not differ very materially from those of Douglas' Squirrel.

" Dental formula: *incis.* $\frac{2}{2}$, *can.* $\frac{0-0}{0-0}$, *mol.* $\frac{4-4}{4-4}$, = 20.

" The body of this most diminutive of all the known species of genuine squirrel in North America, is short, and does not present that appearance of lightness and agility which distinguishes the *S. Hudsonius*. Head large, less elongated, forehead more arched, and nose a little blunter than *Sc. Hudsonius*; ears short; feet of moderate size. The third toe on the fore-feet but slightly longer than the second; the claws are compressed, hooked and acute; tail shorter than the body; the thumb-nail is broad, flat and blunt.

" The fur on the back is dark plumbeous from the roots, tipped with rusty brown and black, giving it a rusty gray appearance. It is less rufous than the *Sc. Hudsonius*, and lighter coloured than the *Sc. Douglasii*. The feet on their upper surface are rufous: on the shoulders, forehead, ears, and along the thighs, there is a slight tinge of the same colour. The whiskers, which are a little longer than the head, are black. The whole of the under surface, as well as a line around the eyes, and a small patch above the nostrils, smoke-gray. The tail for about one half its length presents on the upper surface a dark rufous appearance, many of the hairs being nearly black, pointed with light rufous: at the extremity of the tail, for about an inch and three-fourths in length, the hairs are black, a few of them slightly tipped with rufous. The hind-feet, from the heel to the palms, are thickly clothed with short adpressed light-coloured hairs; the palms are naked, The sides of the body are marked by a line of black commencing at the shoulder and terminating abruptly on the flanks: this line is about two inches in length and four lines wide.

Dimensions.	in.	lines.
Length of head and body	6	2
Tail (vertebræ)	3	6
Do. including fur	5	0
Ears posteriorly	0	3
Do. including fur	0	5
Palm and middle fore-claw	1	3
Sole and middle hind-claw	1	9

SCIURUS LANUGINOSUS. Downy Squirrel.

Sciurus corpore suprà flavescenti-griseo, lateribus argenteo-cinereis, abdomine albo: pilis mollibus et lanuginosis: auribus brevibus: palmis pilis sericeis crebrè instructis; caudâ corpore breviore.

" A singular and beautiful quadruped, to which I have conceived the above name appropriate, was sent to me with the collection of Dr. Townsend. He states in his letter, ' Of this animal I have no further knowledge than that it was killed on the North-west coast,

near Sitka, where it is said to be common: it was given to me by my friend W. F. Tolmie, Esq., surgeon of the Hon. Hudson's Bay Company. I saw three other specimens from Paget's Sound, in the possession of Capt. Brotchie, and understood him to say that it was a burrowing animal.' Sitka is, I believe, the principal settlement of the Russians on Norfolk Sound and Paget's Sound, a few degrees North of the Columbia River.

"The head is broader than that of the *Sc. Hudsonius*, and the forehead much arched. The ears, which are situated far back on the head, are short, oval, and thickly clothed with fur; they are not tufted as in the *Sc. Hudsonius* and *Sc. vulgaris* of Europe, but a quantity of longer fur, situated on the outer base of the ear, and rising two or three lines above the margins, give the ears the appearance of being somewhat tufted. In the Squirrels generally, the posterior margin of the ear doubles forward to form a valve over the auditory opening, and the anterior one curves to form a helix; in the present species the margins are less folded than those of any other species I have examined. The whiskers are longer than the head; feet and toes short; rudimental thumb armed with a broad flat nail; nails slender, compressed, arched and acute; the third on the fore-feet is a little the longest, as in the Squirrels. The tail bears some resemblance to that of the Flying Squirrel, and is thickly clothed with hair, which is a little coarser than those on the back. On the fore-feet the palms are only partially covered with hair; but on the hind feet, the under surface, from the heel even to the extremity of the nails, is thickly clothed with short soft hairs.

"The fur is softer and more downy than that of any other North American species, and the whole covering of the animal indicates it to be a native of a cold region.

"Dental formula: *incis.* $\frac{2}{2}$, *can.* $\frac{0-0}{0-0}$, *mol.* $\frac{4-4}{4-4}$, $=20$.

"The upper incisors are smaller and more compressed than those of *Sc. Hudsonius*; the lower ones are a little longer and sharper than the upper: the upper grinders, on their inner surface, have each an elevated ridge of enamel; on the outer crest or edge of the tooth, there are three sharp points instead of two obtuse elevations, as in the Squirrels generally, and in this particular it approaches the *Spermophiles*. In the lower jaw, the grinders, which are quadrangular in shape, present each four sharp points.

"The incisors are of an orange colour; and the lower incisors are nearly as dark as the upper. Whiskers pale brown. Nails white. The fur on the back, from the roots to near the extremity, is whitish gray; some hairs are annulated near the tips with deep yellow, and at the tip black: on the sides of the body the hairs are annulated with cream colour. Hind-feet above, grizzled with black and cream colour. There is a broad line of white around the eyes; a spot of white on the hind-part of the head, a little in advance of the anterior portions of the ears. The nose is white, and this colour extends along the forehead and terminates above the eyes, where it is gradually blended with the colours on the back. The cheeks are white, a little grayish beneath the eyes. The whole of

the under surface is white, as are also the feet and inner surface of the legs, the hairs being uniform to the roots. The hairs of the tail are for the most part of a light ash colour at the roots; above the ash colour on each hair there is a broad but not well-defined ring of light rufous; this is followed by dark brown, and at the tips the hairs are rufous and gray. Many of the hairs of the tail, however, are white, some of them are black, and others almost uniform rusty yellow.

Dimensions..	in.	lines.
Length of head and body	7	11
Tail (vertebræ)	4	8
Tail including fur	6	0
Palm and middle fore-claw	1	0
Sole and middle hind-claw	1	9
Length of fur on the back	0	7
At the tip of tail	1	10
Height of ear, including fur, measured posteriorly	1	5

"On the back and tail there are so many white hairs interspersed, the white spot on the head being merely occasioned by a greater number of hairs nearly or wholly white, that there is great reason to believe that this species becomes much lighter, if not wholly white, during winter.

"In the shape of the head and ears, and in the pointed projections of the teeth, this species approaches the Marmots and Spermophiles; but in the shape of its body, its soft fur, its curved and acute nails, constructed more for climbing than digging in the earth, and in the third toe being longer than the second, it must be placed among the Squirrels."

Mr. Waterhouse exhibited a new species of Hare from the collection made for the Society by the late Mr. Douglas, and proposed to characterize it under the name of *Lepus Bachmani*: he thought it probable that the species had been brought from California. It was thus described:

Lepus Bachmani. *Lep. intensè fuscus, pilis fuscescenti-flavo nigroque annulatis; abdomine sordidè albo: pedibus suprà pallidis, subtùs pilis densis sordidè fuscis indutis: caudâ brevi, albâ, suprà nigricante, flavido adspersâ: auribus externè pilis brevissimis cinerescenti-fuscis, internè albidis, ad marginem externum, et ad apicem flavescentibus obsitis: nuchâ pallidè fuscescenti-flavâ.*

"Fur long and soft, of a deep gray colour at the base; each hair annulated near the apex with pale brown, and black at the points; on the belly the hairs are whitish externally; on the chest and forepart of the neck the hairs are coloured as those of the sides of the body; the visible portion is pale brown, each hair being dusky at the tip;

chin and throat gray-white. The hairs of the head coloured like those of the body; an indistinct pale longitudinal dash on the flanks just above the haunches: the anal region white. The general colour of the *tarsus* above is white; the hairs, however, are grayish-white at the base, and then annulated with very pale buff colour (almost white), and pure white at the points; the sides of the *tarsus* are brown; the long hairs which cover the under part of the *tarsus*, as well as that of the fore-feet, deep brown. The fore-feet above very pale brown, approaching to white; the hairs covering the toes principally white: the claws are slender and pointed, that of the longest toe very slender. Ears longer than the head, sparingly furnished with hair, the hairs minute and closely adpressed; externally, on the forepart, grizzled with black and yellowish white, on the hinder part grayish-white; the apical portion is obscurely margined with black; at the base the hairs are of a woolly nature, and of a very pale buff colour; the hairs on the occipital part of the head, and extending slightly on to the neck, are of the same colour and of the same woolly character; the ears internally are white, towards the posterior margin obscurely grizzled with blackish, at the margin yellowish.

Dimensions.	in.	lines.
Length	10	0
Tarsus	3	0
Tail and fur	1	3
Ear externally ..	2	8
Nose to ear....	2	$5\frac{1}{2}$

Habitat S.W. coast of N. America, probably California.

"This animal may possibly not be adult; but neither in the teeth, so far as can be ascertained from a stuffed specimen, nor in the character of the fur, can I see any reason for believing it young, excepting that it is much under the ordinary size of the species of the genus to which it belongs; and although it may not be adult, it certainly is not a very young animal. Compared with *Lep. palustris*, with which species it was sent over by Mr. Douglas, it presents the following points of distinction. Although the present animal is not above one-third of the size of that species, the ears measure nearly a quarter of an inch more in length: in fact, they are here longer than the head, whereas in *Lep. palustris* they are much shorter. The next most important difference is in the feet,—which instead of having comparatively short and adpressed hairs which do not conceal the claws, are in *Lep. Bachmani* long and woolly, especially on the under part, and not only conceal the claws, but extend upwards of a quarter of an inch beyond their tips. The claws are more slender and pointed, especially those of the fore-feet. Besides these differences there are some others, which perhaps may be considered of minor importance: the fur is much softer and more dense; the longer hairs are extremely delicate, whilst in *Lep. palustris* they are harsh. As regards the colour, *Lep. palustris* has a very distinct rich yellow tint, which is not observed in the present species, the pale annulations of the hairs

which produce the yellow tint, being replaced by brownish white or pale brown."

Mr. Ogilby pointed out the characters of a new species of Muntjac Deer, which lately died at the Gardens. This species is about the same size as the common Indian Muntjac, but has a longer head and tail; has less red, and more blue in the general shade of the colouring, and is readily distinguished by the want of the white over the hoofs, which is so apparent in its congener. The specimen, a male, was brought from China by J. R. Reeves, Esq., to whom the Society is already indebted for many rare and valuable animals, and to whom Mr. Ogilby proposed to dedicate the present species by applying the name of *Cervus Reevesi*. A female specimen which accompanied that here described, is still living and has lately produced a fawn, which is interesting from exhibiting the spotted character common to the generality of the young in this extensive group.

Mr. Waterhouse then directed the attention of the Meeting to an interesting series of skins of Marsupial animals, brought from Van Diemen's Land by George Everett, Esq., and presented by that gentleman to the Society; the collection includes a specimen of the *Thylacinus*, two species of Kangaroo, and two of the genus *Perameles*, besides others of more common occurrence.

Mr. Owen concluded his memoir on the anatomy of the *Apteryx* by a description of the general structure and peculiarities of its osseous system.

The bones of the *Apteryx* are not perforated for the admission of air, nor do they exhibit the pure white colour which characterizes the skeleton in other birds; their tough and somewhat coarse texture resembles rather that of the bones of the lizard tribe.

The spinal column was found to consist of 15 cervical and 9 dorsal *vertebræ*, and 22 in the lumbar, sacral, and caudal regions. The third to the sixth, inclusive, of the dorsal *vertebræ*, are slightly anchylosed together by the contiguous edges of their spinous processes; but Mr. Owen supposes that notwithstanding this *anchylosis*, a yielding, elastic movement may still take place between these *vertebræ*. A short obtuse process is sent off obliquely forwards, from the inferior surface of the body of the first four dorsal *vertebræ*; the articulation between the bodies is by the adaptation of a surface, slightly concave in the vertical, and convex in the transverse direction, at the posterior end of one *vertebra* to opposite curves at the anterior end of the succeeding one; close to the anterior surface on each side there is a hemispherical pit for the reception of the round head of the rib; the transverse processes are broad, flat, and square-shaped, with the anterior angle obliquely cut off to receive the abutment of the tubercle of the rib; they are not connected together by extended bony splints, but are quite detached, as in struthious birds. The spinous process arises from the whole length of the arch of each *vertebra*; it is truncate above, and with the exception of the first, is of the same breadth throughout: all the dorsal spines are much compressed, the middle ones being

the thinnest, slightly expanding at their truncate extremities. The length of the dorsal region was four inches. The length of the vertebral column behind the dorsal *vertebræ*, included between the *ossa innominata*, was three inches. The first four and the ninth and tenth sacral *vertebræ*, send outwards inferior transverse processes. The *foramina* for the nerves are pierced in the base of the arches of the sacral *vertebræ*; they are double in the anterior ones, but single in the posterior compressed *vertebræ*, where they are situated close to the posterior margin. The cervical *vertebræ* present all the peculiarities of the type of Birds; the inverted bony arch for the protection of the carotid arteries, is first seen developed from the inner side of the inferior transverse processes of the twelfth cervical *vertebra*, but the two sides of the arch are not anchylosed together. The spinous process is thick and strong in the *Vertebra dentata*, but progressively diminishes to the seventh, where it is reduced to a mere tubercle; it reappears at the eleventh, and progressively increases to the dorsal *vertebræ*. The large canal on each side for the vertebral artery and sympathetic nerve, is formed by the *anchylosis* of a rudimental rib to the extremities of an upper and lower transverse process. The spinal chord is least protected by the *vertebræ* in the middle of the neck, where there is the greatest extent of motion. The length of the cervical region was seven inches.

In the first fifteen *vertebræ* the costal appendages were anchylosed; in the nine succeeding *vertebræ* the ribs appear to remain permanently moveable; the first is a slender style about an inch in length, the rest are remarkable for their breadth, which is relatively greater than in any other bird. The second, third, fourth and fifth ribs, articulate with the *sternum* through the medium of slender sternal portions. The appendages to the vertebral ribs are developed in the second to the eighth inclusive; they are articulated by a broad base to a fissure in the posterior margin of these vertebral ribs, a little below their middle; those belonging to the third, fourth, fifth and sixth ribs, are the longest, and overlap the succeeding rib; these processes were not anchylosed in the specimen described. The first four sternal ribs are transversely expanded at their sternal extremities, which severally present a concave surface lined with smooth cartilage and synovial membrane, and playing upon a corresponding smooth convexity in the costal margin of the *sternum*, which thus presents four true enarthrodial joints, with capsular ligaments on each side.

The *sternum* is reduced to its lowest grade of development in the *Apteryx*. In its small size, and in the total absence of a keel, it resembles that of the struthious birds, but differs in the presence of two subcircular perforations, situated on each side of the middle line, in the wide anterior emargination, and in the much greater extent of the two posterior fissures. The anterior margin presents no trace of a manubrial process, as in the Ostrich, the interspace between the articular cavities of the coracoid being, on the contrary, deeply concave. The articular surface for the coracoid is an open groove, externally to which the anterior angles of the *sternum*

are produced into two strong triangular processes, with the *apex* obtuse. The costal margin is thickened, and when viewed anteriorly, presents an undulating contour, from the presence of the four articular convexities for the sternal ribs and the intermediate excavations; the breadth of each lateral perforation is nearly equal to that of the intervening osseous space; in the specimen described they were not quite symmetrical in position. The extent of the posterior notches is equal to one half the entire length of the *sternum*.

The *scapula* and *coracoid* were anchylosed; a small perforation anterior to the articular surface of the *humerus* indicates the separation between the coracoid and rudimental clavicle, of which there is otherwise not the least trace. The coracoid is the strongest bone; its inferior expanded extremity presents an articular convexity adapted to the sternal groove before described. The *scapula* reaches to the third rib; it is slightly curved and expanded at both ends, but chiefly at the articulation. The humerus is a slender, cylindrical, styliform bone, slightly curved, one inch, five lines in length, slightly expanded at both extremities, most so at the proximal end, which supports a transverse, oval, articular convexity, covered with smooth cartilage, and joined by a synovial and capsular membrane to the scapulo-coracoid articulation. A small tuberosity projects beyond each end of the humeral articular surface. The distal end of the *humerus* is articulated by a true but shallow ginglymoid joint with the rudimental bones of the *antibrachium*, and both the external and internal condyles are slightly developed. The *radius* and *ulna* are straight, slender, styliform bones, each nine lines in length; a slight olecranon projects above the articular surface of the ulna; there is a minute carpal bone, two metacarpals, and a single phalanx, which supports the long, curved, obtuse alar claw; the whole length of this rudimental hand is seven lines, including the claw, which measures three lines and a half. A few strong and short quill feathers are attached by ligament to the ulna and metacarpus.

The *iliac* bones in size and shape present the character of the struthious birds. The *pubic* element is a slender bony style connected by ligament to the end of the *ischium*, but attached by bone only at its acetabular extremity. A short pointed process extends from the anterior margin of the origin of the *pubis*. The *acetabulum* is produced anteriorly into an obtuse ridge.

The *femur* is three inches, nine lines in length, slightly bent; the articular head presents a large depression for the strong and complex *ligamentum teres*. The condyles of the *femur* are separated by a wide and deep groove anteriorly, and by a triangular depression behind. The *tibia* is five inches long. Two angular and strong ridges are developed from the anterior part of the expanded head of the *tibia*: the external one affords attachment to *fascia*, and to the expanded tendon of the *rectus femoris latissimus*; the internal has affixed to it the ligament of the small cartilaginous *patella*. The *fibula*, half an inch below its head, is anchylosed to the *tibia*, the attachment continuing for about ten lines; after an interspace of nine lines it again becomes anchylosed, and gradually disappears towards the lower third of the *tibia*.

The distal end of the *tibia* presents the usual trochlear form, but the anterior concavity above the articular surface is in great part occupied by an irregular bony prominence. A small cuneiform bone is wedged into the outer and back part of the ankle joint.

The anchylosed *tarso-metatarsals* form a strong bone, two inches, three lines in length; it expands laterally as it descends and divides at its distal extremity into three parts with the articular pulleys for the three principal toes. The surface for the articulation of the fourth or small internal toe, is about half an inch above the distal end in the internal and posterior aspect of the bones; a small ossicle attached by strong ligaments to that surface gives support to a short *phalanx*, which articulates with the longer ungueal *phalanx*. The number of phalanges in the other toes follows the ordinary law.

After concluding the description of the osteology of the *Apteryx*, of which the preceding is an abstract, Prof. Owen proceeded to observe, "that so far as the natural affinities of a bird are elucidated by its skeleton, all the leading modifications of that basis of the organization of the *Apteryx* connect it closely with the struthious group. In the diminutive and keel-less *sternum* it agrees with all the known struthious species, and with these alone. The two posterior emarginations which we observe in the *sternum* of the Ostrich are present in a still greater degree in the *Apteryx*; but the feeble development of the anterior extremities, to the muscles of which the *sternum* is mainly subservient, as a basis of attachment, is the condition of a peculiarly incomplete state of the ossification of that bone of the *Apteryx*; and the two subcircular perforations which intervene between the origins of the pectoral muscle on the one side, and those of a large inferior dermo-cervical muscle on the other, form one of several unique structures in the anatomy of this bird. We have again the struthious characters repeated in the atrophy of the bones of the wing, and the absence of the clavicles, as in the Emeu and Rhea*. Like testimony is borne by the expansively developed *iliac* and *sacral* bones, by the broad *ischium* and slender *pubis*, and by the long and narrow form of the *pelvis*: we begin to observe a deviation from the struthious type in the length of the *femur*, and a tendency to the gallinaceous type in the shortness of the *metatarsal* segment; the development of the fourth or inner toe may be regarded as another deviation, but it should be remembered that in the size and position of the latter the *Apteryx* closely corresponds with the extinct struthious Dodo. The claw on the inner toe of the *Apteryx* has been erroneously compared with the spur of certain *Gallinæ*, but it scarcely differs in form from the claws of the anterior toes.

"In the broad ribs (see the Cassowary), in the general freedom of *anchylosis* in the dorsal region of the vertebral column, and the numerous *vertebræ* of the neck, we again meet with *struthious* characters; and should it be objected to the latter particular, that some

* In the Ostrich the clavicles are undoubtedly present, though anchylosed, with the *scapula* and *coracoids*, and separate from each other. In the Cassowary they exist as separate short styliform bones.

Palmipeds surpass the Ostrich in the number of cervical *vertebræ*, yet these stand out rather as exceptions in their particular order; while an excess over the average number of cervical *vertebræ* in birds is constant in the *struthious* or *Brevipennate* order. Thus in the Cassowary 19 *vertebræ* precede that which supports a rib connected with the *sternum*, and of these 19 we may fairly reckon 16 as analogous to the cervical *vertebræ* in other birds. In the Rhea there are also 16 *cervical vertebræ*, and not 14, as Cuvier states. In the Ostrich there are 18, in the Emeu 19 cervical *vertebræ*. In the *Apteryx* we should reckon 16 cervical *vertebræ* if we included that which supports the short rudimental but moveable pair of ribs. Of the 22 true grallatorial birds cited in Cuvier's Table of the Number of Vertebræ, only 9 have more than 14 cervical *vertebræ*; while the *Apteryx* with 15 cervical *vertebræ*, considered as a struthious bird, has the fewest of its order. The free bony appendages of the ribs, and the universal absence of air-cells in the skeleton, are conditions in which the *Apteryx* resembles the *Aptenodites*, but here all resemblance ceases: the position in which the *Apteryx* was originally figured* is incompatible with its organization.

"The modifications of the skull of the *Apteryx*, in conformity with the structure of the beak requisite for obtaining its appropriate food, are undoubtedly extreme; yet we perceive in the *cere* which covers the base of the bill in the entire *Apteryx* a structure which exists in all the struthious birds; and the anterior position of the nostrils in the subattenuated beak of the Cassowary is an evident approach to that very singular one which peculiarly characterizes the *Apteryx*. With regard to the digestive organs, it is interesting to remark, that the thickened muscular *parietes* of the stomach of the most strictly granivorous of the struthious birds do not exhibit that apparatus of distinct *Musculi digastrici* and *laterales* which forms the characteristic structure of the gizzard of the gallinaceous order: the *Apteryx*, in the form and structure of its stomach, adheres to the struthious type. It differs again in a marked degree from the *Gallinæ*, in the absence of a crop. With respect to the *cæcal* appendages of the intestine, though generally long in the *Gallinæ*, they are subject to great variety in both the struthious and grallatorial orders: their extreme length and complicated structure in the Ostrich and Rhea form a peculiarity only met with in these birds. In the Cassowary, on the other hand, the *cæca* are described by the French academicians as entirely absent. Cuvier† speaks of 'un cæcum unique' in the Emeu. In my dissections of these struthious birds I have always found the two normal *cæca* present, but small; in the Emeu measuring about five inches long and half an inch in diameter; in the Cassowary measuring about four inches in length. The presence of two moderately developed *cæca* in the *Apteryx* affords therefore no indication of its recession from the struthious type: these *cæca* correspond in their condition, as they do in the other struthious birds, with the nature

* Shaw's Miscellany, xxiv. pl. 1075.

† *Leçons d'Anat. Comp.* 1836. iv. p. 291.

of the nutriment of the species. It is dependent on this circumstance also, that in the grallatorial bird (*Ibis*), which the *Apteryx* most resembles in the structure of its beak, and consequently in the nature of its food, the *cæca* have nearly the same relative size; but as regards the *Grallæ*, taken as an order, no one condition of the *cæca* can be predicated as characteristic of them. In most they are very small; in many single.

"What evidence, we next ask, does the generative system afford of the affinities of the *Apteryx*? A single, well-developed, inferiorly grooved, subspiral, intromittent organ attests unequivocally its relations to the struthious group; and this structure, with the modifications of the plumage, and the peculiarities of the skeleton, lead me to the same conclusion at which I formerly arrived*, from a study of the external organization of the *Apteryx*, viz. that it must rank as a genus of the cursorial or struthious order; and that in deviating from the type of this order it manifests a tendency in one direction, as in the feet, to the gallinaceous order; and in another, as in the beak, to the *Grallæ*; but that it cannot, without violation of its natural affinities, be classed with either."

A living specimen of the *Gymnotus electricus*, from the Amazon, was exhibited by Mr. Porter.

August 28th, 1838.

No meeting took place.

* Art. *Aves*, Cycl. of Anat. and Phys., i. 1836, p. 269.

September 11th, 1838.

Lieut. Col. Sykes, in the Chair.

Some notes were read by the Chairman upon three skins of digitigrade *carnivora*, which were on the table for exhibition: one of these was a beautiful skin of the *Aguara Guazu* of Azara, (*Canis jubatus*, Desm.) and the other two, those of the *Felis Pardina*, Temm., in an adult and nonadult state. Respecting the first of these Col. Sykes offered the following observations:

"Azara in his preliminary notices of the two species of *Canis*, *C. jubatus* and *C. Azaræ*, says, I prefer for the family the Spanish names of Zorro or Fox to the Guaranese name Aguara, which also means fox; and he accordingly heads the notices with the words 'Zorros or Foxes.' The *C. jubatus*, measuring 5 feet to the tail, and the tail of which is 19 inches, is certainly a Brobdignag Fox. I mention this circumstance in illustration of the fact, that Azara, in his classification, appears to have overlooked analogies. And this remissness I hope will authorize me, without the imputation of presumption, in venturing upon the remarks I am about to make.

"The skin I put before the Society is that of Azara's *Canis jubatus*, and as it and a fellow skin in my possession are the only specimens of the kind in England (indeed I believe there are only two other specimens in Europe, one in Paris, the other in Cadiz), and as it will most probably have been seen but by few of the gentlemen present, I shall be happy to find that its exhibition is acceptable. Azara states that the *Canis jubatus* has 6 incisors in the upper jaw, then on either side of a vacant space follow 2 canines and 6 molar teeth, three of which, however, look more like incisors than molars; the lower jaw is in all respects similar to the upper, except that the interval is wanting between the canine teeth and the incisors, and there is one additional molar tooth; in other respects the form and general character of these animals are those of the Dog: they differ, however, chiefly in being *unsociable* and *nocturnal*. The tail is much *thicker* and *more bushy*, and they never raise or curl it; the *body* and *neck* are *shorter* and covered with longer fur; the *neck* is also *thicker*; the hair too is thicker; the eye is smaller, the face flatter; the *head rounder* and *more bulky* as far as the front of the eyes, where the thick part diminishes more speedily and terminates in a sharper muzzle, furnished with whiskers; the ear is broader at its origin, and thicker and stiffer, and when they are on the look out they present the hollow part forwards and approximate their ears much more than Dogs. They do not bark nor howl like Dogs, nor is their voice heard often; in fact they so cry but seldom, and submit to be killed without uttering a sound. Other discrepancies between his two 'Zorros' and Dogs are added, but it is unnecessary to specify them. I perfectly agree with Azara that he has afforded sufficient

proofs of the wide difference between the *Canis jubatus* and Dogs (the most striking part of which difference, however, he has omitted to characterize, viz. the long mane), but here my coincidence in opinion ceases, for it is evident that the animal of which the skin lies upon the table has not the slightest approximation to the character of a Fox, which Azara would make it. A question is thus opened, to what genus or subgenus of the second division of *digitigrada* does the animal belong? Unfortunately the skins in my possession do not afford the means of fixing definitively its place in the family, there being neither skull nor teeth, no toes, and no means of determining whether or not an anal pouch existed. Azara's dental characters are applicable to the genus *Canis*, but he has omitted to notice those minute points which might constitute subgeneric differences. One fact mentioned, that the canines of the *only* adult he examined were ten lines long, although they were very much worn, would apply rather to *Hyæna* than to *Canis*. The number of toes is omitted. Buffon calls the *Canis jubatus* the Red Wolf; but, were not its solitary and nocturnal habits and its predilection for certain fruits and vegetables sufficient to separate it, the remarkable mane at once prevents the alliance. Apparently, therefore, being neither fox, dog, nor wolf, it may be permitted us to look to a neighbouring genus, to see whether or not there are more characteristics common to the animal under consideration and species of that genus than we have yet met with.

"While residing with my family at Cadiz during the spring, three beautiful skins were imported from Buenos Ayres; they were quite unknown to the owner and his friends, and learning that I took an interest in natural history, I was asked to examine and give my opinion upon them. The heavy head, the large ears, the bulky body and comparatively slender hind-limbs, the short neck, the shaggy hair, but particularly the singular mane, fixed my attention; and in the absence of primary generic characters, I would have pronounced the skins to be those of a beautiful species of *Hyæna*: but the few naturalists who have examined the New World have not yet discovered the Hyæna, and it would have been rash, with the slender data before me, to have expressed a definitive opinion. Nevertheless on returning to England and deliberately examining Azara's description of the form and habits of the *Canis jubatus*, my original opinion is so much strengthened that I am induced to submit the whole question to the consideration of naturalists, in the hope that on an opportunity occurring it may be taken advantage of to determine the primary generic characters, with a view to the allocation of the animal into its exact place in the digitigrade family. But to me it is a matter of indifference whether or not the animal has the technical characters of *Canis* or *Hyæna*. Nature, in her wondrous chain of animated beings dispersed over the world, is never defective in a link (at least on the great continents), for if the identical species of one continent be wanting, in another we surely find its analogue. The Ostrich of Africa has its analogue in America in the *Rhea*, and in the *Emu* and Cassowary of Australia: the *Llama* replaces the Camel, and the *Fe-*

lis concolor, the Lion in America; but the numerous cases are familiar to all naturalists and need not be enumerated; and with respect to the Aguara Guazu (*Canis jubatus*), if it be not an *Hyæna*, it is at least the analogue of the *Hyæna*. The multitudinous reasons of Azara already quoted against his two Zorros being Dogs, may be applied almost *verbatim* in proof of *one* of them being an *Hyæna*; and in his detailed description of the Aguara Guazu he mentions many of its habits that are common to the *Hyæna vulgaris*—its walk with long paces, its absence of a predal disposition on living animals (Azara instances poultry not being touched while passing within reach of the animal he had chained up) in its wild state, not committing havock amongst herds or lesser flocks, and its indifference to a meat or vegetable diet, indeed its predilection for fruits and sugar cane. An *Hyæna* I brought from India with me, and which is now living in the Zoological Gardens, Regent's Park, London, and which is as affectionate to me as a spaniel dog would be, was fed during the whole voyage from India on boiled rice and a little ghee (liquid butter;) and these instances of a community of habits between the Hyæna and *Canis jubatus* could be greatly multiplied. If Azara's dental formula be right, the Aguara Guazu cannot technically be an *Hyæna*, and it may be desirable to constitute it a subgenus; but as I before said, it will suffice if my speculations assist in any way to rivet a link in the chain of nature."

With respect to the skin of *Felis Pardina* Col. Sykes remarked, "Although Temminck, in his *Monographie de Mammalogie*, p. 116, in a note, says the skin of this European *Felis* is well known amongst the furriers as the Lynx of Portugal, I have nowhere been able to meet with a specimen in London; and as amongst my friends scarcely any one appeared to be aware of the existence of a Spanish Lynx, I thought it might be acceptable to the members to exhibit specimens in a state of maturity and nonage. In Andalusia, whence the specimens come, it is called *Gäto clavo* (*clavo* meaning the pupil of the eye), illustrative of the spotted character of the skin. Some peasants in Andalusia make short jackets of the skins. The animal inhabits the Sierra Morena. I bought both skins at Seville for thirty reales, about 6*s*. 3*d*. Neither the British Museum nor the Zoological Society have specimens.

"Temminck describes the *Pardina* as 'Toutes les parties du corps *lustre*, à peu près de la même teinte que dans le caracal.' This is certainly not the description of my animal, the colour of the adult being reddish gray, and that of the non-adult light fawn; nevertheless there are so many other points common to both, that it would be unadvisable to consider them distinct."

A specimen of the *Alauda Calandra*, Linn., from Andalusia, was afterwards exhibited by Col. Sykes, accompanied with the following notice:

"I brought two specimens of these delightful singing-birds from Andalusia with me this spring; and on comparing them with the type of the genus, I am satisfied they approximate more closely to

the genus *Mirafra* than to that of *Alauda*. The bill is infinitely more robust than that of *Alauda*. The size of the bird is larger, and its *ensemble* rather that of *Mirafra* than *Alauda*, and the internal organization has a close resemblance to the former, in the proportional length of the intestines and the *colon*, in the form of the lobes of the liver, in the spleen, in the size of the gizzard and substance of the digastric muscles, and particularly in the form and position of the *cæca*. Mr. Yarrell very justly remarks, that the bird in departing from the type of Lark approaches to that of *Plectrophanes* of Meyer; but differs from the latter in not having a curved long hind claw, and also in its more robust character; in short, it has a station between the Larks and the Finches; it differs also slightly from *Mirafra* in its hind claws being those of a Lark, while its bill and other external and internal characters are those of *Mirafra*. On the whole, therefore, it appears desirable to divide the genus *Alauda* into subgenera, and constitute the *Londra* a new subgenus, to which the name of *Londra* may be given. The Andalusian bird would thus be the *Londra Calandra*, and an undescribed species from China, now in the gardens of the Society, appears to form a second example of this genus. The generic characters of *Londra* are as follow:

LONDRA. Genus novum.

Rostrum crassum; capitis longitudinem æquans; basi altum, subcompressum; maxilla arcuata; tomiis integerrimis.

Nares plumis anticum versus tectæ.

Alæ corpore longiores, acuminatæ; remigibus, primâ sub-abbreviatâ, tertiâ longissimâ, secundâ et quartâ ferè æqualibus; reliquis gradatim brevioribus.

Cauda cuneata.

Pedes robusti; *unguis* hallucis rectus elongatus.

Typus est, *Alauda Calandra*.

"The specific characters of *Londra Calandra* as published are sufficiently accurate.

"The following are the measurements of a male bird; and as I have seen many scores of them, I think I may say they would apply to the generality of individuals of the species.

"Length, from the tip of the bill to the rump, 5 inches; bill, $\frac{4}{10}$; tail, $2\frac{1}{2}$ inches; *tibia*, 1 $\frac{1}{10}$; *tarsi*, including nail, 1$\frac{1}{10}$; hind claw, $\frac{1}{10}$ inch; liver of two lobes, one much longer than the other; gall-bladder fully developed; spleen cylindrical, $\frac{2}{10}$ inch; intestines, 9 $\frac{3}{10}$ inches; *duodenum* very wide; small intestines narrow; *cæca*, $\frac{1}{10}$, little more than oblong specks; *colon*, $\frac{1}{8}$ inch long; gizzard very small; but digastric muscle, $\frac{3}{10}$ inch thick; *testes* very large, nearly globular; *irides* black. These birds are fed upon canary seed in Andalusia, but in Lisbon they are fed upon wheat; nevertheless they are fond of raw meat, flies, and worms. They are soon accustomed to confinement, and they sing unconcernedly, although surrounded by spectators; their notes, some of which are a kind of double-tongueing in the phrase of flute players, are remarkably rich and full."

Mr. Blyth made some remarks on the plumage and progressive changes of the Crossbills, stating that, contrary to what has generally been asserted, neither the red nor saffron-tinted garb is indicative of any particular age. He had known specimens to acquire a second time the red plumage, and that much brighter than before; and he exhibited to the Meeting two individuals recently shot from a flock in the vicinity of the metropolis, which were exchanging their striated nestling feathers for the saffron-coloured dress commonly described to be never acquired before the second moulting.

He also exhibited a Linnet killed during the height of the breeding season, when the crown and breast of that species are ordinarily bright crimson, in which those parts were of the same hue as in many Crossbills; and observed that the same variations were noticeable in the genera *Corythraix* and *Erythrospiza*. Mr. Blyth called attention also to the fact, that in the genus *Linota* the females occasionally assumed the red breast, supposed to be peculiar to the other sex, and that they continue to produce eggs when in this livery; a circumstance very apt to escape attention, as most naturalists would at once conclude such specimens to be males without further examination.

September 25th, 1838.

No meeting took place.

October 9, 1838.

Rev. F. W. Hope in the Chair.

The reading of a paper by Richard Owen, Esq., on the Osteology of the *Marsupialia*, was commenced.

Mr. Martin drew the attention of the Meeting to the crania of the Sooty and White-eyelid Monkeys, *Cercopithecus fuliginosus* and *C. Æthiops*, which were placed upon the table, and upon which he proceeded to remark as follows:

"It is now some years since I stated to the late Mr. Bennett that in the skeleton of a Sooty Monkey I had discovered the presence of a distinct fifth tubercle on the last molar of the lower jaw; recently I have observed the same fact in the skull of the Collared or White-eyelid Monkey (*C. Æthiops*) circumstances of some interest, as this tubercle appears to be always absent in the *Cercopitheci*, and also in such as the Malbrouck, Grivet, and Green Monkeys, &c., which have been separated from the *Cercopitheci* under the subgeneric title *Cercocebus*, Geoff., the Sooty and the White-eyelid Monkeys being included; though, as far as we can see, on no feasible grounds, differing from the foregoing species, as they do, in physiognomy and also in style of colouring. However this may be, the Sooty and White-eyelid Monkeys approximate to their supposed congeners in a more remote degree than has hitherto been supposed. Now with regard to the genera *Semnopithecus* and *Macacus*, both of which are from India, and the African genera *Inuus* and *Cynocephalus*, this fifth tubercle is a constant character and accompanied by the presence of laryngeal sac culi; and in another African genus, viz. *Colobus*, a fifth tubercle also exists, but whether accompanied or not by laryngeal sacs is still to be determined. May not this fifth tubercle, it may here be asked, bring the Sooty and White-eyelid Monkeys within the pale of the *Macaci*? and the question will bear considering. Our reply, however, would be in the negative; for as we have ascertained by dissection, the Sooty Monkey, at least, is destitute of laryngeal sacs, (but has large cheek pouches) and we may readily infer the same of the other species, its immediate ally. The relationship, as it appears to us, between these two animals and the Indian *Macaci*, is that of representation. They have not indeed the muzzle so produced and the supra-orbital ridge so developed as in the *Macaci*; but in these points they exceed the African Guenons generally, and are also we think stouter in their proportions. They appear, indeed, to constitute a form, intermediate between the *Macaci* and *Cercopitheci*, on the one hand; as are the *Colobi* between the *Semnopitheci* and *Cercopitheci* on the other. What the *Colobi* of Africa are to the *Semnopitheci*, these two monkeys (and others have perhaps to be added) are to the *Macaci*. With respect to the genus *Cercocebus*,

I should be inclined to restrict it, excluding from it the Grivet and Green Monkeys, and modify its characters accordingly, taking the Sooty and White-eyelid Monkeys as its typical examples, a plan which, it appears to me, is preferable to the creation of a new generic title, which often leads to confusion."

Mr. Owen exhibited a preparation of the *ligamentum teres* in the Coypou, which he had received from Mr. Otley of Exeter, and read the following extract in a letter from that gentleman:—

"I have enclosed with this the thigh bone, and the *scapula*, *clavicle*, and *humerus* of a Coypou, which came into my hands after having been mangled by a stuffer of animals, and which had been preserved alive for some weeks by a gentleman of this place. I believe that not many opportunities have occurred of dissecting this animal in England; and as I found a difference between the specimen in question and that described by Mr. Martin, I thought the portions I have forwarded might be interesting to you, had it not fallen to you to dissect one of these animals. Mr. Martin states that the thigh bone had no round ligament: you will see that there exists a well-developed one in this, as there also was on the other thigh bone."

Mr. Martin observed, that on referring to his account of the dissection of this animal, it will be found, that he is so far from asserting it as a fact, positively determined, that the *ligamentum teres* is wanting, that, after giving an account of the state of the *acetabulum* and head of thigh bones as he found them, he adds, "it would be desirable that another specimen should be examined before this peculiarity (viz. the absence of a *ligamentum teres*) is insisted on as an ascertained fact." See Zool. Proc. 1835, p. 182.

October 23, 1838.

William Yarrell, Esq., in the Chair.

A letter was read from M. Julien Desjardins, Secretary of the Natural History Society of the Mauritius, stating that it was his intention to leave that island on the 1st of January next, for England, with a large collection of objects in natural history, many of which he intended for the Society. A letter from Colonel P. Campbell, Her Majesty's Consul General and Agent at Alexandria, was also read. In this letter Col. P. Campbell states that he had not yet succeeded in gaining any further information respecting the probability of procuring some White Elephants for the menagerie. A letter received from Lieut.-Colonel Doherty, Governor of Sierra Leone, stated, that he was using every exertion to procure for the Society a male and female Chimpanzee, in which attempt he fully expected to be successful; but he feared that he should not be able to obtain a living specimen of the Hippopotamus, from the superstitious dread with which the natives regard these animals.

Some specimens of Flying Lemurs (*Galeopithecus*) were upon the table, and in reference to them Mr. Waterhouse stated that his object in bringing them before the Meeting was to notice certain characters which appeared to him to indicate the existence of two species in these specimens. He remarked that in systematic works three species of the genus *Galeopithecus* are described, founded upon differences of size and colour; as regards the latter character, he had never seen two specimens which precisely agreed; and with respect to size, the dimensions given of two out of the three species are evidently taken from extremely young animals. Mr. Waterhouse then proceeded to point out the distinctive characters of the two species on the table, for which he proposed the specific names of *Temminckii* and *Phillippinensis*; of these two the first is the larger species, measuring about two feet in total length, and having a skull two inches eleven and a half lines in length. The anterior incisor of the upper jaw is broad and divided by two notches into three distinct lobes; the next incisor on each side has its anterior and posterior margins notched; and the first molar (or the tooth which occupies the situation of the canine) has its posterior edge distinctly notched. This tooth is separated by a narrow space anteriorly and posteriorly, from the second incisor in front, and the second molar behind; the temporal ridges converge towards the *occiput*, near which, however, they are separated usually by a space of about four lines.

The second species (*G. Philippinensis*) is usually about twenty inches in length, and has a skull two inches seven lines in length. It may be distinguished from *G. Temminckii* by the proportionately larger ears, and the greater length of the hands; the skull is narrower in proportion to its length; the muzzle is broader and more

obtuse; the orbit is smaller; the temporal ridges generally meet near the *occiput*, or are separated by a very narrow space; the anterior incisor of the upper jaw is narrow, and has but one notch; the next incisor on each side is considerably larger, longer, and stronger than in *G. Temminckii*, and moreover differs in having its edges even; the same remarks apply to the first false molar. The incisors and molars here form a continuous series, each tooth being in contact with that which precedes, and that which is behind it. The most important difference perhaps which exists between the two species in question consists in the much larger size of the molar teeth in the smaller skull, the five posterior molars occupying a space of ten lines in length, whereas in *G. Temminckii*, a much larger animal, the same teeth occupy only nine lines. The above are the most prominent characteristic differences in the two species, though several other minor points of distinction may be observed.

Mr. Blythe called the attention of the Meeting to the skull of a Cumberland Ox, presenting an unnatural enlargement of the facial bones, accompanied with a most remarkable development of the horns, one of which measured four feet in circumference at its base.

The reading of Professor Owen's paper "On the Osteology of the Marsupialia," was completed. After some preliminary remarks upon the importance of the study of the skeleton, in investigating the natural groups of this order and the determination of the interesting fossils of Australia, Professor Owen proceeded in the first place to point out the principal modifications in the general form of the skull as observed in the various genera of marsupial animals.

"The skull," says Professor Owen, "is remarkable in all the genera for the small proportion which is devoted to the protection of the brain, and for the great expansion of the nasal cavity immediately anterior to the cranial cavity.

"In the stronger carnivorous species the exterior of the *cranium* is characterized by bony ridges and muscular impressions; but in the smaller herbivorous species, as the Petaurists and Potoroos, the *cranium* presents a smooth rounded surface as in birds, corresponding with the smooth unconvoluted surface of the simple brain contained within.

"The breadth of the skull in relation to its length is greatest in the Wombat and Ursine Dasyure in which it equals three-fourths the length, and least in the *Perameles lagotis* in which it is less than one-half. The occipital region, which is generally plane and vertical in position, forms a right angle with the upper surface of the skull, from which it is separated by an occipital or lambdoidal *crista*. This is least developed in the Myrmecobius, Petaurists, and Kangaroo, and most so in the Opossum, in which, as also in the Koala, the crest curves slightly backwards, and thus changes the occipital plane into a concavity, well adapted for the insertion of the strong muscles from the neck and back.

"The upper surface of the skull presents great diversity of cha-

racter, which relates to the different development of the temporal muscles, and the varieties of dentition in the different genera. In the Wombat the coronal surface offers an almost flattened tract, bounded by two slightly elevated temporal ridges, which are upwards of an inch apart posteriorly, and slightly diverge as they extend forwards to the anterior part of the orbit.

"The skull of the Opossum presents the greatest contrast to that condition, for the sides of the *cranium* meet above at an acute angle, and send upwards from the line of their union a remarkably elevated sagittal crest, which, in mature skulls, is proportionally more developed than in any of the placental Carnivora, not even excepting the strong-jawed Hyæna.

"The Thylacine and Dasyures, especially the Ursine Dasyure, exhibit the sagittal crest in a somewhat less degree of development. It is again smaller, but yet well marked in the Koala and Perameles. The temporal ridges meet at the lambdoidal suture in the Phalangers and Hypsiprymni, but the size of the muscles in these does not require the development of a bony crest. In the Kangaroo the temporal ridges, which are very slightly raised, are separated by an interspace of the third of an inch. They are separated for a proportionally greater extent in the Petaurists; and in the smooth and convex upper surface of the skull of *Pet. sciureus*, *Pet. pygmæus*, and in Myrmecobius the impressions of the feeble temporal muscles almost cease to be discernible.

"The zygomatic arches are, however, complete in these as in all the other genera: they are usually, indeed, strongly developed; but their variations do not indicate the nature of the food so clearly, or correspond with the differences of animal and vegetable diet in the same degree, as in the placental Mammalia. No Marsupial animal, for example, is devoid of incisors in the upper jaw, like the ordinary Ruminants of the placental series; and the more complete dental apparatus with which the herbivorous Kangaroos, Potoroos, Phalangers, &c. are provided, and which appears to be in relation to the scantier pasturage, and the dry and rigid character of the herbage or foliage on which they browse, requires a strong apparatus of bone and muscle for the action of the jaws, and the exercise of the terminal teeth. There are, however, sufficiently marked differences in this part of the marsupial skull; and the weakest zygomatic arches are those of the Insectivorous *Perameles* and *Acrobates*, in which structure we may discern a correspondence with the edentate Ant-eaters of the placental series. Still the difference of development is greatly in favour of the Marsupial Insectivora.

"The Hypsiprymni are next in the order of development of the zygomatic arches, which again are proportionally much stronger in the true Kangaroos. The length of the zygomata in relation to the entire skull is greatest in the Koala and Wombat. In the former animal they are remarkable for their depth, longitudinal extent, and straight and parallel course. In the latter they have a considerable curve outwards, so as greatly to diminish the resemblance which otherwise exists in the form of the skull between the Wombat and

the herbivorous Rodentia of the placental series, as, e. g., the *Viscaccia*.

"In the carnivorous Marsupials the outward curve of the zygomatic arch (which is greatest in the Thylacine and Ursine Dasyure,) is also accompanied by a slight curve upwards; but this curvature is chiefly expressed by the concavity of the lower margin of the zygoma, and is by no means so well marked as in the placental Carnivora. It is remarkable that this upward curvature is greater in the slender zygomata of the Perameles than in the stronger zygomata of the Dasyures and Opossums. In the Koala and Phalangers there is also a slight tendency to the upward curvature; in the Wombat the outwardly expanded arch is perfectly horizontal. In the Kangaroo the lower margin of the zygoma describes a slightly undulating curve, the middle part of which is convex downwards.

"In many of the Marsupials, as the Kangaroo, the Koala, the Phalangers, and the Opossums, the superior margin of the zygoma begins immediately to rise above the posterior origin of the arch. In the Wombat an external ridge of bone commences at the middle of the lower margin of the zygoma, and gradually extends outwards as it advances forwards, and, being joined by the upper margin of the zygoma, forms the lower boundary of the orbit, and ultimately curves downwards in front of the ant-orbital foramen, below which it bifurcates, and is lost. This ridge results, as it were, from the flattening of the anterior part of the zygoma, which thus forms a smooth and slightly concave horizontal platform for the eye to rest upon. The same structure obtains, but in a slighter degree, in the Koala. In the Kangaroo the anterior and inferior part of the zygoma is extended downwards in the form of a conical process, which reaches below the level of the grinding teeth. A much shorter and more obtuse process is observable in the corresponding situation in the Phalangers and Opossum.

"The relative length of the facial part of the skull, anterior to the zygomatic arches, varies remarkably in the different Marsupial genera. In the Wombat it is as six to nineteen; in the Koala as five to fourteen; in the Phalangers it forms about one-third of the length of the entire skull; in the carnivorous Dasyures and Opossums it is more than one-third. In Perameles, Macropus, and *Hypsiprymnus murinus*, Ill., the length of the skull anterior to the orbit is equal to the remaining posterior part; but in a species of Hypsiprymnus from Van Diemen's Land (*Hypsiprymnus myosurus*, Ogilb.) the facial part of the skull anterior to the orbit exceeds that of the remainder; and the arboreal *Hypsiprymni* from New Guinea present a still greater length of muzzle. In most Marsupials the skull gradually converges towards the anterior extremity, but in the *Perameles lagotis* the skull is remarkable for the sudden narrowing of the face anterior to the orbits, and the prolongation of the attenuated snout, preserving the same diameter for upwards of an inch before it finally tapers to the extremity of the nose. In the Koala the corresponding part of the skull is as remarkable for its shortness as it is in the *Per. lagotis* for its length, but it is bounded laterally by parallel lines

through its whole extent. Before concluding this account of the general form of the skull, I may observe that the Kangaroo resembles the placental Ruminantia and some Rodentia, as the *Viscaccia*, in the prolongation downwards of two long processes corresponding in function to the mastoid, but developed from the exoccipital bones. The same processes are developed in an almost equal degree in the Koala, and, in the Wombat, coexist with a corresponding development of the true mastoids. The exoccipitals each send down a short obtuse process in the Potoroos, Perameles, Petaurists, Phalangers, Opossums, and Dasyures.

Of the Composition of the Cranium.—"The occipital bone is developed, as in the placental Mammalia, from four centres or elements, the basilar below, the supra-occipital above, and the ex-occipitals at the sides; but these elements remain longer separate, and in some genera do not become, at any period of life, united by continuous ossification.

"In the skull of an aged Virginian Opossum I found the supra-occipital still distinct from the ex-occipitals, and these not joined together, though anchylosed to the basilar element: in this Marsupial animal they meet above the *foramen occipitale*, and complete its boundaries, as the corresponding superior vertebral *laminæ* complete the medullary canal, in the region of the spine. I have found the same structure and condition of the occipital bone of an adult *Dasyurus Ursinus*, and it is exhibited in the plate of the *cranium* of this species given by M. Temminck*. In the skull of a *Perameles nasuta* the ex-occipitals were separated by an interspace, so that a fissure was continued from the upper part of the *foramen magnum* to the supra-occipital element. The same structure may be observed in the Kangaroo, and is very remarkable in the young skulls of this species; I found this superior notch wide and well-marked in *Macropus Bennettii*. In the Wombat the corresponding fissure is very wide, and the lower margin of the supra-occipital is notched, so that the shape of the *foramen magnum* somewhat resembles that of the trefoil leaf. In the Koala, the Phalanger, Petaurus, Hypsiprymnus, and *Dasyurus Maugei*, the elements of the occipital bone present the usual state of bony confluence.

"The temporal bone generally presents a permanent separation of the squamous, petrous, and tympanic elements. I have observed this reptile-like condition of the bone in the mature skulls of an Ursine Dasyure, a Virginian Opossum, a Perameles, in different species of Potoroo and Kangaroo, in the Wombat, and in the Koala. So loose, indeed, is the connection of the tympanic bone, that, without due care, it is very liable to be lost in preparing the skulls of the Marsupiata. In the Kangaroo and Wombat it forms a complete bony tube, about half an inch in length, with an irregular exterior, and is wedged in between the mastoid and articular processes of the temporal bone. In the Potoroo the bony circle is incomplete at the upper part; in the Perameles and Dasyures the tympanic bone forms

* *Monographie de Mammalogie*, pl. viii.

a semicircle, the posterior part being deficient, and the tympanic membrane being there attached to a descending process of the squamous element of the temporal. Here we have a near approach to the form of the tympanic bone in birds, but we have a still closer resemblance to its condition both in birds and reptiles, in its want of union with, and relations to, the petrous element of the temporal bone. In the Rodent quadruped the tympanic, petrous, and mastoid elements of the temporal bone are always anchylosed together; this condition is well shown in the skull of the Porcupine and Beaver, in which the mastoid element sends down a thick obtuse process behind the petro-tympanic portion. It is to the expansion of the petro-tympanic and not of the mastoid portion of the temporal bone that the enlargement of the tympanic cavity is due, in the Rodentia; and this expansion forms in that order, as is well known, a large *bulla ossea*, which is situated anterior and internal to the mastoid process. In many of the Marsupials, as the Dasyures, Petaurists, Perameles, Potoroos, and Koala, there is also a large *bulla ossea* for the purpose of increasing the extent of the auditory cavity; but, with one single exception, the Wombat, this *bulla* is not formed by the tympanic or any other element of the temporal bone, but by the expansion of the base of the great *ala* of the sphenoid bone. It is only in the *Perameles lagotis* that, in addition to the preceding *bulla*, I have observed an external dilatation of the petrous element of the temporal bone, which thus forms a second and smaller *bulla* on each side, behind the large *bulla ossea* formed by the sphenoid. In other Marsupiata the petrous bone is of small size, generally limited to the office of protecting the parts of the internal ear, and sometimes, as in the Koala, is barely visible at the exterior of the base of the skull. The petrous and mastoid elements are commonly anchylosed together. In the Kangaroos, Koala, and Wombat, the petro-mastoid bone is of a large size, and is visible in two situations on the outside of the skull, viz. at the usual place at the base, where the petrous portion is wedged in between the basilar bone, ex-occipital and sphenoid; and again at the side of the *cranium*, where the mastoid portion appears between the squamous, ex-occipital, and supra-occipital bones. In the Wombat it sends outwards the strong compressed process which terminates the lateral boundaries of the occipital plane of the *cranium*.

"The auditory chamber of the ear is augmented in the Phalangers, the Koala, the Kangaroo, and Potoroo, by a continuation of air-cells into the base or origin of the zygomatic process; but the extent of the bony air-chambers communicating with the tympanum is proportionally greatest in the Petaurists, or Flying Opossums, where, besides the sphenoid *bulla*, the mastoid element, and the whole of the zygomatic process of the temporal bone are expanded to form air-cells with very thin and smooth walls, thus presenting an interesting analogy in the structure of the *cranium* to the class of birds.

"The direction of the bony canal of the organ of hearing corresponds, as in the placental Mammalia, with the habits of the species. The *meatus* is directed outwards and a little forwards in the car-

nivorous Dasyures; outwards and a little backwards in the Perameles and Phalanger; outwards, backwards, and upwards in the Kangaroos; and directly outwards in the Petaurists and Wombat: but the differences of direction are but very slightly marked.

"The squamous element of the temporal bone generally reaches half-way from the root of the zygoma to the sagittal ridge or suture: it is most developed in the Wombat, in which its superior margin describes a remarkably straight line. The zygomatic process of the temporal bone is in general compressed, and much extended in the vertical direction in the Opossum, Dasyure, Phalanger, Koala, and Kangaroo. In the Wombat it curves outwards from the side of the head in the form of a compressed and almost horizontal plate; it is then suddenly twisted into the vertical position, to be received in the notch of the malar portion of the arch.

"The cavity, corresponding to the sphenoidal *bulla ossea* in other Marsupials, is in this species excavated in the lower part of the squamous element of the temporal bone at the inner side of the articular surface for the lower jaw.

"This articular surface, situated at the base of the zygomatic process, presents in the Marsupial, as in the placental Mammalia, various forms, each manifesting a physiological relation to the structure of the teeth, and adapted to the required movements of the jaws in the various genera. In the herbivorous Kangaroo the glenoid cavity forms a broad and slightly convex surface, as in the Ruminants, affording freedom of rotation to the lower jaw in every direction. In the Phalangers and Potoroos the articular surface is quite plane. In the Perameles it is slightly convex from side to side, and concave from behind forwards. In the Wombat it is formed by a convex narrow ridge considerably extended, and slightly concave, in the transverse direction. This ridge is not bounded by any descending process posteriorly, so that the jaw is left free for the movements of protraction and retraction; but this structure is widely different from that which facilitates similar movements in the Rodentia. In these there is a longitudinal groove on each side, in which the condyle of the lower jaw plays backwards and forwards, but is impeded in its lateral movements; these, on the contrary, are freely allowed to the Wombat, and the oblique disposition of the lines of enamel upon the molar teeth correspond with the various movements of which the lower jaw of the Wombat is thus susceptible. In the Koala the glenoid cavity is a transversely oblong depression, with a slight convex rising at the bottom; indicating rotatory movements of the jaw. In the carnivorous Dasyures it forms a concavity still more elongated transversely, less deep than in the placental Carnivora, but adapted, as in them, to a ginglymoid motion of the lower jaw; the joint differs in the absence of an interarticular cartilage in the Marsupial Carnivora. In all the genera, save in the Wombat, retraction of the lower jaw is opposed by a descending process of the temporal bone immediately anterior to the *meatus auditorius* and tympanic bone.

"The glenoid cavity presents a characteristic structure in the

Marsupialia. In all the species, the Petaurists excepted, the malar bone forms the outer part of the articular surface for the lower jaw; and in the *Dasyurus Maugei, Dasyurus Ursinus, Perameles, Hypsiprymnus* and *Macropus*, the sphenoid *ala* forms the inner boundary of the same surface; but it does not extend so far backwards in the Wombat or Koala.

"The sphenoid bone has the same general form and relative position as in the ordinary Mammalia, but presents a similarity to that in the Ovipara, in the persistence of the pterygoid processes as separate bones. It is only in the Koala that I have observed a complete obliteration of the suture joining the basilar element of the sphenoid with that of the occipital bone.

"The chief peculiarity in the sphenoid bone is the dilatation of the root of the great *ala* already alluded to; this dilatation communicates with and is filled with air from the tympanum; it forms the hemispherical *bulla ossea* on each side of the *basis cranii* in the Dasyures and Phascogales, and the large semiovate *bullæ* in the Myrmecobius: but in the Koala the *bullæ* are still more developed, and are produced downwards to an extent equal with the ex-occipital processes; they are somewhat compressed laterally, and instead of the smooth and polished surface which characterize them in the preceding genera, terminate here in a rough ridge. The dilated air-chambers or *bullæ* of the sphenoid are relatively smaller in the Phalangers and Potoroos than in the Dasyures; and they are incomplete posteriorly in the Kangaroo and Wombat. In the Brush Kangaroo the above process from the sphenoid joins the base of the large descending process of the ex-occipital. The pterygoid processes are relatively largest in the Kangaroo, Wombat, and Koala, and present in each of these species distinct hamular processes. In the Potoroo, Kangaroo, and Wombat, the sphenoid *ala* combines with the pterygoid process to form a large and deep depression opening externally. In the Kangaroo, Dasyures, Koala and Wombat, the great *alæ* of the sphenoid articulate with the parietal bones; but, by a very small portion in the two latter species; in the Perameles and Potoroos, the sphenoid *alæ* do not reach the parietals.

"There is little to notice in the parietal bones except the obliteration of the sagittal suture in those species in which a bony crista is developed in the corresponding place: they present a singularly flattened form in the Wombat, in an aged skull of which, and in a similar one in the Kangaroo, I observe a like obliteration of the sagittal suture. In the Kangaroo, Potoroo, Petaurus, Phalanger, and Myrmecobius, there is a triangular inter-parietal bone. The corresponding bone I find in three pieces in the skull of a Wombat.

"The coronal suture presents in most of the Marsupials an irregular angular course, forming a notch in the frontals on each side, which receives a corresponding triangular process of the parietal bone: this form of the suture is least pronounced in the Myrmecobius and Acrobates. A process corresponding to the posterior frontal augments the bony boundary of the orbit in the Thylacine, the Ursine Dasyure, and in a slighter degree in the Virginian Opossum. It is relatively

most developed in the skull of the *Myrmecobius fasciatus*, where the orbit is large; but the bony boundary of the orbit is not complete in any of the Marsupials. In the Myrmecobius there is a deep notch at the middle of the supra-orbital ridge. I have found the frontal suture obliterated only in the Virginian Opossum and Petaurists; but in the latter it is remarkable, that the other sutures of the head, as the lambdoidal and sagittal, continue distinct.

"The frontal bones are chiefly remarkable for their anterior expansion, and the great share which they take in the formation of the nasal cavity. In the Thylacine the part of the *cranium* occupied by the frontal sinuses exceeds in breadth the cerebral cavity, from which it is divided by a constriction.

"The lachrymal bones vary in their relative size in different Marsupiata. In the Koala they extend upon the face about a line beyond the anterior boundary of the orbit; and at this part they present a groove with one large, and two or three small perforations; in the Wombat their extent upon the face is slightly increased; it is proportionally greater in the Kangaroos, Potoroos, Phalangers, and Dasyures, in which this part of the lachrymal bone presents two perforations, but it is close to the orbit. The Thylacine, as compared with the Wolf, presents a greater extent of the facial portion of the lachrymal bone, and thus indicates its inferior type. In the Myrmecobius the lachrymal bone exhibits its greatest relative development.

"The malar bone is very strong and of great extent in all the Marsupiata: least developed in the *Perameles lagotis*, it here presents a singular form, being bifurcate at both extremities; the *processus zygomaticus maxillæ superioris* is wedged into the cleft of the anterior fork; the corresponding process of the temporal bone fills up the posterior space; the lower division of this bifurcation is the longest, and in all the Marsupiata enters into the composition of the articular surface for the lower jaw, except in the Petaurists, where it just falls short of this part. The anterior bifurcation of the malar bone is not present in the Marsupiata generally: the external malo-maxillary suture forms an oblique and almost straight line in the Wombat, Phalanger, Opossum, Dasyurus, and Kangaroo. Owing to the low development of the zygomatic process of the superior maxillary in the Wombat, the malar bone is not suspended in the zygomatic arch in this Marsupial, as in the placental Rodentia. It is of relatively much larger size, and of a prismatic form, arising from the development of the oblique external ridge above described. In the Kangaroo, Potoroo, Great Petaurus, and Phalanger, it is traversed externally by a ridge showing the extent of attachment of the masseter; in the Koala the ridge extends along the bone near the upper margin, and the surface below presents a well-marked excavation.

"The nasal bones vary in their form and relative size in the different genera; they are longest and narrowest in the Perameles, shortest and broadest in the Koala. Their most characteristic structure is the expansion of the upper and posterior extremity,

which is well marked in the Wombat, Myrmecobius, Petaurists, Phalangers, Opossums, and Dasyures. In the Potoroos the anterior extremities of the nasal bones converge to a point which projects beyond the intermaxillaries. In some Petaurists and the Perameles the corresponding points reach as far as the intermaxillaries; and in *Perameles lagotis* the bony case of the nasal passages is further increased by the presence of two small rostral bones, resulting, as in the Hog, from ossification of the nasal cartilage.

"The intermaxillary bones always contain teeth, and the ratio of their development corresponds with the bulk of the dental apparatus which they support. They are consequently largest in the Wombat, where they extend far upon the side of the face, and are articulated to a considerable proportion of the nasal bones, but do not, as in the placental Rodentia, reach the frontal, or divide the maxillary bone from the nasal. They present the next degree of inferior development in the Koala, and both in this species and in the Wombat bulge outwards, and thus remarkably increase the transverse diameter of the osseous cavity of the nose.

"Neither in *Hypsiprymnus* nor *Macropus* do I find the incisive palatal foramina entirely in the intermaxillary bones, as described by the author of the text in Pander and d'Alton's 'Skelete der Beutelthiere,' a small proportion of their bony circumference is due to the anterior extremity of the palatal process of the maxillaries, and the same structure obtains in the Wombat, Koala, and Opossums. In the *Dasyuri* and *Phalangers* a greater proportion of the posterior boundary of these foramina is formed by the maxillaries. In the Petaurists they are entirely surrounded by the maxillaries; while in the Perameles the incisive foramina are wholly surrounded by the intermaxillary bones. They always present the form of two longitudinal fissures.

"The maxillary bones in the Wombat send up a long, narrow, irregular nasal process which joins the frontal and nasal bones, separating them from the intermaxillaries; the part which projects into the temporal fossa behind the orbit presents two or three smooth tuberosities, formed by the thin plate of bone covering the pulps of the large curved posterior grinders. The corresponding part in *Perameles lagotis* is perforated by numerous minute apertures like a cribriform plate, and this structure is presented in a slighter degree in the Potoroos and Ursine Dasyure. The ant-orbital foramen does not present any marked variety of size, which is generally moderate. It is much closer to the orbit in the carnivorous Marsupiata than in the corresponding placental quadrupeds. It is relatively largest in the Ursine Dasyure, and presents the form of a nearly vertical fissure in the Wombat. I have observed it double in the Kangaroo. The chief differences in the maxillary bones, independently of the teeth and their alveoli, are presented by the palatal processes; the modifications of which I shall consider in conjunction with those presented by the palatal processes of the palatal bones. The perforations of the bony palate deserve particular attention; they are generally specific, and of

consequence in the determination both of recent and fossil species.

"In *Phalangista Cookii*, some of the Petaurists, and the great Kangaroo (*Macropus Major*), the bony palate is of great extent, and presents a smooth surface, concave in every direction towards the mouth; this is pierced by two small posterior palatine foramina, situated at the anterior external angles of the palatine bones, close to the transverse palato-maxillary sutures; behind the foramina in the Kangaroo, and pierced in the suture itself in the Petaurists, are a few small irregular perforations. The bony palate is also entire in the *Hypsiprymnus Ursinus*, Mull.

"In *Macropus Bennettii* there are four orifices at the posterior part of the bony palate: the two anterior ones are situated upon the palato-maxillary suture, of an ovate form, with the small end forwards; the two posterior foramina are of a less regular form and smaller size.

"In the Brush Kangaroo (*Macropus Brunii*, Cuv.) the posterior palatal foramina present the form of two large oval fissures placed obliquely, and converging posteriorly. They encroach upon the posterior border of the maxillary plate. Anterior to these vacancies there are two smaller foramina, and posterior to them are one or two similar foramina. In the Australian Potoroos, Wombat, and Koala, the posterior palatal openings are large and oval, and situated entirely in the palatal bones; posterior and external to these there are two small perforations. In the Phalangers (*Phal. Cookii* excepted) the palatal openings are proportionally larger; they extend into the palatal process of the maxillaries; and the thin bridge of bone which divides the openings in the Potoroo, &c. is wanting; the two perforations at the posterior external angles of the palatine bones are also present. In the Virginian Opossum the bony palate presents eight distinct perforations besides the incisive foramina; the palatal processes of the palatine bone extend as far forwards in the median line as the third molares; a long and narrow fissure extends for an equal distance (three lines) into the palatal processes, both of the palatines and maxillaries; behind these fissures, and nearer the median line, are two smaller oblong fissures; external, and a little posterior to these, are two similar fissures, situated in the palato-maxillary suture; lastly, there are two round perforations close to the posterior margin of the bony palate.

"Now there is no carnivorous quadruped in the placental series which has a bony palate characterized by perforations and vacuities of this kind. In the dog, the cat, and the weasel tribe, the bony palate is only perforated by two small oblique canals, which open in or near the palato-maxillary suture. The very great interest which is attached to the fossil jaws of the Stonesfield Marsupials, the only mammiferous remains hitherto discovered in the secondary formations, will justify the minuteness, perhaps tediousness, with which I have dwelt on characters that, inclusive of the teeth, serve to distinguish the *cranium* of the Marsupial from that of any placental quadruped. The structure of the bony palate in the Marsupiata is interesting in other respects. Since the defective condition of this part of the *cra-*

nium is one of the characteristics of the skull of the bird, it might be expected that some approximation would be made to that structure in the animals which form the transition between the placental and oviparous classes. We have already noticed the large vacuities which occur in the bony palate of nearly all the Marsupials, but this imperfectly ossified condition is most remarkable in the Acrobates and *Perameles lagotis*. In the latter the bony roof of the mouth is perforated by a wide oval space, extending from the second spurious molars to the penultimate molars, exposing to view the vomer and convolutions of the inferior spongy bones in the nasal cavity. Behind this space there are six small perforations; two in a transverse line, midway between the great vacancy and the posterior margin of the bony palate, and four in a transverse line, close to that margin.

"In the Ursine Dasyure a large transversely oblong aperture is situated at the posterior part of the palatal processes of the maxillary bones, and encroaches a little upon the palatines; this aperture is partly, perhaps in young skulls, wholly bisected by a narrow longitudinal osseous bridge. The large aperture in the skull of the *Dasyurus Ursinus*, figured by Temminck, is the result of accidental injury to the bony palate. — (*Monographie de Mammalogie*, Pl. viii.) In *Mauge's Dasyure* two large ovate apertures, situated in the palato-maxillary sutures, are divided by a broad plate of bone; posterior to these are two apertures of similar size and form, which, being situated nearer the mesial line, are divided by a narrower osseous bridge; each posterior external angle of the bony palate is also perforated by an oval aperture. In the Viverrine Dasyure the two vacancies which cross the palato-maxillary suture are in the form of longitudinal fissures, corresponding in situation with the fourth and fifth grinders; the posterior margin of the bony palate has four small apertures on the same transverse line.

Cavity of the Cranium.—"The parietes of the cranial cavity are remarkable for their thickness in some of the marsupial genera. In the Wombat the two tables of the parietal bones are separated posteriorly for the extent of more than half an inch, the interspace being filled with a coarse cellular *diploë*; the frontal bones are about two and a half lines thick. In the Ursine Dasyure the cranial bones have a similar texture and relative thickness. In the Koala the texture of the cranial bones is denser, and their thickness varies from two lines to half a line. In the Kangaroo the thickness varies considerably in different parts of the skull, but the parietes are generally so thin as to be diaphanous, which is the case with the smaller marsupials, as the Potoroos and Petaurists. The union of the body of the second with that of the third cranial vertebræ takes place in the marsupiata, as in the placental mammalia, at the *sella turcica*, which is overarched by the backward extension of the lesser *alæ* of the sphenoid. The optic foramina and the *fissuræ laceræ anteriores* are all blended together, so that a wide opening leads outwards from each side of the *sella*. Immediately posterior, and external to this opening, are the *foramina rotunda*, from each of which, in the Kangaroo, a remarkable groove leads to the *fossa*

gasseriana, at the commencement of the *foramen ovale*; the same groove is indicated in a slighter degree in the *Dasyuri* and Phalangers, but is almost obsolete in the Wombat and Koala. The carotid canals pierce the body of the sphenoid, as in the bird, and terminate in the skull, very close together, behind the *sella turcica*, which is not bounded by a posterior clinoid process. The petrous bone in the Kangaroo, Koala, and Phalanger, is impressed above the *meatus auditorius*, by a deep, smooth, round pit which lodges the lateral appendage of the *cerebellum*. The corresponding pit is shallower in the *Dasyuri*, and almost obsolete in the Wombat. The middle, and posterior *fissuræ laceræ* have the usual relative position, but the latter are small. The condyles are each perforated anteriorly by two *foramina*. The composition and form of the *foramen magnum* we have already spoken of. It is of great size, in relation to the capacity of the *cranium*; the aspect of its plane is backwards, and slightly downwards.

" In the Kangaroo and Phalanger a thin ridge of bone extends for the distance of one or two lines into the periphery of the tentorial process of the *dura mater*, and two sharp spines are sent down into it from the upper part of the *cranium* in the *Phalangista Vulpina*. The *tentorium* is supported by a thick ridge of bone in the Thylacine, but it is not completely ossified in any of the Marsupiata; in some species indeed, as the Dasyures, the Koala, and the Wombat, the bony ridge above described does not exist. There is no ossification of the falciform ligament, as in the Ornithorhynchus. The anterior depression, or olfactory division of the cavity of the *cranium*, as it may be termed from its large size, is separated in a well-marked manner from the proper cerebral division of the cavity. It is relatively smallest in the Koala. In all the Marsupials it is bounded anteriorly by the cribriform plate of the ethmoid bone, which is converted into an osseous reticulation by the number and size of the olfactory apertures. The cavity of the nose, from its great size and the complication of the turbinated bones, forms an important part of the skull. It is divided by a complete bony *septum* to within one-fourth of the anterior aperture, the anterior margin of the *septum* is slightly concave in the Koala, describes a slightly convex line in the Wombat, Kangaroo, and Phalanger, and a sigmoid flexure in the Dasyure. A longitudinal ridge projects downwards from the inside of each of the nasal bones, and is continued posteriorly into the superior turbinated bone; this bone extends into the dilated space anterior to the cranial cavity, which corresponds with the frontal sinuses. The convolutions of the middle spongy bone are extended chiefly in the axis of the skull; the processes of the anterior convoluted bone are arranged obliquely from below, upwards and forwards. They are extremely delicate and numerous in the Dasyures and Phalanger; they consist of thin *laminæ* of bone beautifully arranged on the convex surface of the *os turbinatum*, and placed vertically to that surface in the *Potoroo*; but the bone becomes very simple in the Kangaroo, Koala, and Wombat. The nasal cavity communicates freely with large maxillary sinuses, and,

finally, terminates by wide apertures behind the bony palate. In the skull the nasal cavity communicates with the mouth, as beforementioned, by means of the various large vacuities in the palatal processes.

" The lower jaw of the marsupiata is a part of their osseous structure which claims more than ordinary attention, in consequence of the discussions to which the fossil specimens of this bone, discovered in the oolitic strata of Stonesfield, have given rise. I have examined the two specimens in the possession of Dr. Buckland, the specimen formerly in the collection of Mr. Broderip, and that which is preserved in the Museum at York; the composition of the lower jaw, each ramus of which consists of one piece of bone, the convex condyle, and the double fangs of the molar teeth, prove the mammiferous character of these remains; the size, elevation, and form of the coronoid process of the lower jaw, the production of the angle of the jaw, with the development of the canines, and the pointed tubercular crowns of the molar teeth, indicate the carnivorous and insectivorous character of the species in question. The number of the incisors, eight in the lower jaw, and the structure and proportions of the molar teeth, approximate these small *insectivora* most nearly to the smaller species of the modern genus *Didelphis*; but the number of the molars in one of the specimens exceeds that of any insectivore, placental, or marsupial, which was known at the period when Cuvier wrote on this fossil. Recently, however, a genus of insectivorous mammal (*Myrmecobius*) has been discovered in Australia, presenting the modifications of the *cranium* which characterize the marsupiata, and having nine tuberculate molares in each ramus of the lower jaw.—(*See Mr. Waterhouse's Memoir, Zool. Trans.* ii. pl. 28. fig. 2, 5.) Besides the osteological characters above alluded to, there is a character in the lower jaw of the marsupial animals, not peculiar to the genus *Didelphis*, which serves to distinguish it from that of the placental mammalia. In the carnivorous marsupials, as the Thylacine, the lower maxillary bone very nearly resembles in general form that of the corresponding placental species, as the dog; a similar transverse condyle is placed low down, near the angle of the jaw; the strong coronoid process rises high above it, and is slightly curved backwards; there is the same well-marked depression on the exterior of the ascending ramus for the firm implantation of the temporal muscle, and the lower boundary of this depression is formed by a strong ridge extended downwards and forwards from the outside of the condyle. But in the dog and other placental digitigrade *carnivora*, a process, representing the angle of the jaw, extends directly backwards from the middle of the above ridge, which process gives fixation to the articulation of the jaw, and increases the power by which the *masseter* acts upon the jaw. Now, although the same curved ridge of bone bounds the lower part of the external depression of the ascending ramus in all the marsupiata, it does not in any of them send backwards, or in any other direction, a process corresponding to that just described in the dog. The angle of the jaw is as if it were bent in-

wards in the form of a process encroaching in various shapes and various degrees of development, in the different marsupial genera, upon the interspace of the *rami* of the lower jaw. In looking down upon the lower margin of the jaw, we see therefore, in place of the margin of a vertical plate of bone, a more or less flattened surface extended between the external ridge and the internal process or *inflected* angle. In the Opossums this internal angular process is triangular and trihedral, directed inwards, with the point slightly curved upwards. In the Dasyures it has a similar form, but the apex is extended into an obtuse process. In the Thylacine the base of the inverted angle is proportionally more extended, and a similar structure is presented by the fossil Phascolothere. In the Perameles the angle of the jaw forms a still longer process; it is of a flattened form, extended obliquely inwards and backwards, and slightly curved upwards. In the Potoroos and Phalangers the process is broad, with the apex slightly developed; it is bent inwards, and bounds the lower part of a *wide* and deep depression on the inside of the ascending *ramus*. In the great Kangaroo the internal margin of this process is curved upwards, so as to augment the depth of the internal depression above-mentioned. The internal angular process arrives at its maximum of development in the Wombat, and the breadth of the base of the ascending ramus very nearly equals the height of the same; this broad base also inclines downwards and outwards from the inflected angle, and the same peculiarity occurs in the jaw of the fossil Phascolothere. In the Koala the size of the process in question is also considerable, but it is compressed, and directed backwards, with the obtuse apex only bending inwards, so that the characteristic flattening of the base of the ascending *ramus* is least marked in this species.

"There is no depression on the inner side of the *ramus* of the jaw in the Koala, but its smooth surface is simply pierced near its middle by the dental artery. There is a corresponding perforation on the external surface of the *ramus*, upon which we observe the external muscular depression bounded below by a broad angular ridge. In the Dasyure, there is no external perforation corresponding with the dental canal on the inside of the *ramus*. The *ramus* is likewise entire in the Petaurists, Phalangers, Perameles, and Opossums. In the Wombat the ascending *ramus* is directly perforated by a round aperture immediately posterior to the commencement of the dental canal: the corresponding aperture is of larger size in the Kangaroo. But in the Potoroos both the external and internal depressions of the ascending *ramus* lead to wide canals, or continuations of the depressions, which pass forwards into the substance of the horizontal *ramus*, and soon uniting into one passage, leave a vacant space in the intervening bony *septum*: this structure, if it had existed only in the jaw of a fossil marsupial, would have supported an argument for its Saurian nature, on account of a nearly similar structure in the jaw of the Crocodile. The posterior aperture of the dental canal is situated in the Potoroos and Wombat, as in the Stonesfield fossils, just behind the last molar tooth; and in the Wombat a vascular groove is continued from the foramen along the

inner side of the ramus of the jaw, as in the same fossils. In the Thylacine and Ursine Dasyure, and in their fossil congeners, the Thylacothere and Phascolothere, the condyle of the lower jaw is placed low down on a level with the molar series: it is raised a little above that level in the Opossums, and ascends in proportion to the vegetable diet of the species.

"In all those Marsupiata which have few or very small incisors, the horizontal *rami* of the jaw converge towards a point at the *symphysis*. The angle of convergence is most open in the Wombat, and the gradual diminution is most marked and direct. The internal surface of the *symphysis menti* is almost horizontal, and is convex from side to side in the interval between the molars and incisors. The suture becomes obliterated in aged skulls; it is also wholly obliterated in the skull of a Koala now before me: in all the other Marsupial *crania* which I have examined, the *rami* of the lower jaw are disjoined at the *symphysis*; and in the Opossum, both the *rami* of the lower jaw and all the bones of the face are remarkable for the loose nature of their connection.

"The vertebral column is divisible in all the Marsupiata into the usual classes of cervical, costal, lumbar, sacral, and caudal vertebræ.

"The cervical vertebræ invariably present the usual number, seven, and the usual character of the perforation of the transverse process, or rather the presence and union of the outer extremities of the upper and lower transverse processes. In the Dasyures, Opossums, Perameles, and Phalangers, the seventh cervical vertebra has only the upper transverse process, and consequently wants the character of the perforation, as in many of the ordinary Mammalia. In the Koala, Wombat, Potoroos, and Kangaroos, the seventh vertebra is perforated like the rest; but in the Kangaroo both the *dentata* and atlas have the transverse processes grooved merely by the vertebral arteries; and in the Koala and Wombat the atlas presents only the perforation on each side of the superior arch.

"In the Perameles and some other Marsupials, as the Cayopollin, an affinity to the Reptilia is manifested in the structure of the atlas, which exhibits a permanent separation of the superior laminæ from the centre or body below. In the Koala and Wombat the body of the atlas remains permanently cartilaginous; at least, this is its condition in an adult skeleton of each of these animals in the Hunterian Museum, in which the lower part of the vertebral ring is completed by dried gristly substance. In the Petaurists, Kangaroos, and Potoroos, the atlas is completed below by an extension of ossification from the centres developed in the superior laminæ into the cartilaginous nucleus representing the body; and the ring of the vertebræ is for a long time interrupted by a longitudinal fissure in the middle line, the breadth of which diminishes with age. This fissure is represented in figures of the atlas of a Potoroo and Kangaroo given by Pander and d'Alton (Beutelthiere, fig. *c*. pls. iii. and vii.), but in some of the skeletons of these Marsupials examined by me I find the ring completed, and the fissure obliterated. In all the Marsupiata the spine of the *dentata* is well developed both in the vertical and

longitudinal directions, but most so in the Virginian and Crab-eating Opossums, where it increases in thickness posteriorly; in these species also the third, fourth, and fifth cervical vertebræ have their spines remarkably long and thick, but progressively diminishing from the third, which equals in height and thickness, but not in longitudinal extent, the spine of the dentata. These spines are four-sided, and being closely impacted one behind another must add greatly to the strength while they diminish the mobility of this part of the spine. I know of no other Mammiferous genus which presents the same structure: in the Armadillos the corresponding spines are largely developed, but they are anchylosed together. In the Orang the cervical spines are remarkably developed, but have the ordinary slender subcylindrical rounded form. Tyson, who describes and particularly figures the above structure of the cervical vertebræ in the Opossum, conjectures that it is given to this arboreal animal in order that there might be 'no danger of its breaking its neck should it happen to fall to the ground by chance or design.' Unfortunately for this reasoning, however, the Phalangers, Koala, and other Marsupiata, whose arboreal habits render them equally liable to a fall, present the usual structure of the five posterior cervical vertebræ, the spines of which are all much less than that of the *dentata*, and in the Phalangers and Petaurists almost obsolete. I observe in the *Phalangista Cookii* that the superior flattened arches of the five last cervical vertebræ bear a ridge on each side of the spine, having the same direction and form, and nearly the same size. The structure of the transverse processes of the cervical vertebræ, in the Opossum, is adapted to the strengthening and fixation of this part of the vertebral column; they are expanded nearly in the axis of the spine, but obliquely, so that the posterior part of one transverse process overlaps the anterior part of the succeeding. This structure is exhibited in a slighter degree in the cervical vertebræ of the Dasyures, Phalangers, and Great Kangaroo. In the Petaurists, Potoroos, Wombat, and Koala, the direction and simpler form of the transverse processes allows of greater freedom of lateral motion. In the Koala and Wombat a short obtuse process is given off from the under part of the transverse process of the sixth cervical vertebra. In the Potoroos, Kangaroos, Petaurists, Phalangers, Opossums, and Dasyures, this process is remarkably expanded in the direction of the axis of the spine; in the Perameles corresponding processes are observed progressively increasing in size, on the fourth, fifth, and sixth cervical vertebræ.

"The number of the dorsal vertebræ is greatest in the Wombat, where it is fifteen, corresponding with the number of pairs of ribs; it is least in the Petaurists which have twelve dorsal vertebræ. In all the other genera there are thirteen. In the Koala the length of the spine of the first dorsal hardly exceeds that of the last cervical; but in all other Marsupials the difference is considerable, the first dorsal spine being much longer; those of the remaining dorsal vertebræ progressively diminish in length, and increase in breadth and thickness. They slope backwards towards the centre of motion. In Mauge's Dasyure this is shown to be at the ninth

dorsal vertebra, by the verticality of its spine, towards which both the preceding and succeeding spines incline. In the Perameles the centre of motion is at the eleventh dorsal vertebra; in the Potoroo and Kangaroo at the twelfth; in the Petaurists at the thirteenth vertebra. In the Phalangers, Opossum, Koala, and Wombat, the flexibility of the spine is much diminished, and the centre of motion is not defined by the convergence of the spinous process towards a single vertebra, but they all incline slightly backwards.

"The lumbar vertebræ are four in number in the Wombat, seven in the Petaurists, and six in other Marsupiata, the total number of true vertebræ being thus the same in all the genera. The anterior oblique processes, which begin to increase in length in the three posterior dorsal vertebræ, attain a great size in the lumbar vertebræ, and are locked into the interspace of the posterior oblique processes, which are double on each side, except in the Perameles, and in the last lumbar vertebræ of all the other genera. The transverse processes of the lumbar vertebræ progressively increase in length as the vertebræ approach the *sacrum*; they are most developed in the Wombat, where they are directed obliquely forwards. In the Kangaroos, Potoroos, and Perameles they are curved forwards, and obliquely downwards. The length of these and of the anterior oblique processes is relatively least in the Petaurists, Phalangers, and Opossums.

"The number of vertebræ succeeding the lumbar, which are anchylosed together in the sacral region of the spine, amount in the Wombat to seven; but if we regard those vertebræ only as sacral which join the *innominata*, then there are three. In the Phalangers there are generally two sacral vertebræ; but in a *Phal. Cookii* I have observed three sacral vertebræ, both by anchylosis and juncture with the *ossa innominata*. In the Kangaroos and Potoroos the impetus of the powerful hinder extremities is transferred to two anchylosed vertebræ. In the Perameles there is only a single sacral vertebra, the spine of which is shorter and thicker than those of the lumbar, and turned in the contrary direction, viz. backwards. In Mange's Dasyure two sacral vertebræ are anchylosed, but it is to the expanded transverse processes of the anterior one that the *innominata* are joined. The same kind of union exists in the Viverrine Dasyure, but three vertebræ are anchylosed together. In the Phalangers and Petaurists there are two sacral vertebræ. In *Petaurus taguanoides* and *Pet. macrurus* three are anchylosed together, though two only join the *ilium*. In the Wombat the transverse processes of the numerous anchylosed vertebræ are remarkable for their length; those of the first four are directed outwards and are confluent at their extremities; the remaining ones are turned in a slight degree backwards, and very nearly reach the tuberosities of the *ischia*, behind which they gradually diminish in size, and are lost in the three last caudal vertebræ. The transition from the sacral to the caudal vertebræ is very obscure in the Wombat; if we limit the sacral to the three which join the *ilium*, then there remain twelve vertebræ for the tail. The spinal canal is com-

plete in all but the last three, which consist only of the body. There are no inferior spines; and as only the six posterior vertebræ, which progressively diminish in length, extend beyond the posterior aperture of the *pelvis*, the tail is scarcely visible in the living animal. In the Koala the tail is also very short. In one species of Perameles I find eighteen caudal vertebræ, in another twenty-three.

"In two species of Potoroo there are twenty-four caudal vertebræ, but the relative length of the tail differs in these by one-third, in consequence of the greater length of the bodies of the vertebræ. In the Great Kangaroo there are twenty-two, while in Bennett's Kangaroo there are twenty-four caudal vertebræ. In the *Phalangista vulpina* there are twenty-one caudal vertebræ. In the *Petaurus macrurus* I find twenty-eight caudal vertebræ, while in the *Pet. sciureus* there are but twenty. The bodies of the middle caudal vertebræ, in both these species, are remarkably long and slender. In the *Dasyurus Maugei* I find twenty caudal vertebræ.

"In the Virginian Opossum there are twenty-two caudal vertebræ; the spinal canal is continued along the first six, beyond these the superior spinous processes cease to be developed, and the body gives off above only the two anterior and two posterior oblique processes, which are rudimental, and no longer subservient to the mutual articulation of the vertebræ. The transverse processes are single on the first five caudal vertebræ, and are nearly the breadth of the body, but diminish in length from the second caudal, in which they are generally the longest. In the other vertebræ a short obtuse transverse process is developed at both extremities of the body on either side, so that the dilated articular surfaces of the posterior caudal vertebræ present a quadrate figure.

"In most of the Marsupials, which have a long tail, this appendage is subject to pressure on some part of the under surface. In the Kangaroo this must obviously take place to a considerable degree when the tail is used as a fifth extremity to aid in supporting or propelling the body. In the Potoroos and Perameles the tail also transmits to the ground part of the superincumbent pressure of the body by its under surface, when the animal is erect; but it is not used as a crutch in locomotion, as in the Kangaroos. In the Phalangers and Opossums the tail is prehensile, and the vessels situated at the under surface are liable to compression when the animal hangs suspended by the tail. To protect these vessels, therefore, as well as to afford additional attachment to the muscles which execute the various movements for which the tail is adapted in the above-mentioned Marsupiata, V-shaped bones, or inferior arches (*hæmapophyses*) are developed, of various forms and sizes, and are placed opposite the articulations of the vertebræ, analogous to the situation of the superior arches in the sacral region of the spine in Birds, and in the dorsal region of the spine in the Chelonian Reptiles. The two *crura* of the subvertebral arch embrace and defend the blood vessels; and the process continued from their point of union presents a variety of forms in different genera. In the Virginian Opossum and Vulpine Phalanger they are simple, about a quarter of an inch in

length where longest, directed obliquely forwards, and diminish in size as they approach the extremity of the tail. In Cook's Phalanger I find the *hæmapophyses* commence between the second and third caudal vertebræ, increase in length to the fourth, and then progressively diminish to the end of the tail: the penultimate and antepenultimate presenting a permanent separation of the lateral moieties, and an absence of the spine.

"In the Potoroos the extremity of the long anterior spines is dilated, and produced backwards and forwards; the posterior smaller ones become expanded laterally, and give off similar but shorter processes from each side, whereby the base of the support is extended.

"In the Great Kangaroo the spine of the first subvertebral arch only is simple and elongated; the extremities of the others are expanded, and in some jut out into four obtuse processes, two at the sides and two at the interior and posterior surfaces. In a carefully prepared skeleton of *Macropus Benettii*, I found these inferior spines wanting between the last nine vertebræ of the tail. In the Petaurists, Phascogales, and Dasyures, where the tail acts as a balancing pole, or serves, from the long and thick hair with which it is clothed, as a portable blanket to keep the nose and extremities warm during sleep, the subvertebral arches are also present, but less in number, and of smaller relative size. They are here principally subservient to the attachment of muscles,—their mere mechanical office of defending the caudal vessels from pressure not being required.

"The ribs consist of thirteen pairs, excepting in the Wombat and Petaurists: the first of these is the shortest, and, except in some of the Petaurists, the broadest. In the *Pet. macrurus*, the fifth, sixth, or seventh are the broadest, and the ribs generally have, both in this species and in *Pet. sciureus*, a more compressed form than in the other Marsupials; but this character does not exist in *Petaurus Taguanoides*. In the Great Kangaroo they are very slender and rounded, except at the sternal extremities, which are flattened for the attachment of the cartilages. In this species the anterior pairs of ribs articulate directly with the sternum. The cartilages of the other pairs are long and bent towards the sternum, but do not join it; nor are they confluent, but have a gliding motion one over the other. In the Opossum there are seven pairs of true ribs, and six which may be regarded as *costæ nothæ*. In the Wombat six pairs only out of the fifteen reach the sternum.

"The sternum consists of a succession of elongated bones, generally six in number, but in the Wombat four. The first bone, or *manubrium sterni*, is the largest, and presents in many species a triangular shape, from the expansion of its anterior part, and sometimes a rhomboidal figure. A strong keel or longitudinal process is given off in many species from the middle of its inferior or outer surface; the side next the cavity of the chest is smooth and slightly concave. In the Wombat, Phalangers, and others, the keel is produced anteriorly into a strong process, against the sides of which the clavicles abut: the first pair of ribs join the produced anterior

angles of the manubrium. In the Dasyures, Opossums, Phalangers, and Petaurists, the manubrium is compressed and elongated, and the clavicles are joined to a process continued from its anterior extremity. The small clavicles of the Kangaroo have a similar connection.

"The cartilages of the true ribs, (which frequently become ossified in old Marsupials) are articulated as usual to the interspaces of the sternal bones; the last of these supports a broad flat cartilage.

"The clavicles are relatively strongest and longest in the burrowing Wombat, weakest and shortest in the Great Kangaroo. In the latter they are simply curved with the convexity forwards, and measure only two inches in length. In the Wombat they are upwards of three inches in length, and have a double curvature; they are expanded and obliquely truncate at the sternal extremity, where the articular surface presents a remarkably deep notch: they become compressed as they approach the acromion, to which they are attached by an extended narrow articular surface. In the Koala the clavicles are also very strong, but more compressed than in the Wombat, bent outwards in their whole extent, and the convex margin formed, not by a continuous curve, but by three almost straight lines, with intervening angles, progressively diminishing in extent to the outermost line which forms the articular surface with the acromion. In most of the other Marsupials the clavicle is a simple compressed elongated bone, with one general outward curvature. In the genus *Perameles* there are no clavicles.

"The scapula varies in form in the different Marsupiata. In the Petaurists it forms a scalene triangle, with the glenoid cavity at the convergence of the two longest sides. In the Wombat it presents a remarkably regular oblong quadrate figure, the neck being produced from the lower half of the anterior margin, and the outer surface being traversed diagonally by the spine, which, in this species, gradually rises to a full inch above the plane of the scapula, and terminates in a long narrow compressed acromion arching over the neck to meet the clavicle. In the Koala, the superior *costa* does not run parallel with the inferior, but recedes from it as it advances forwards, and then passes down, forming an obtuse angle, and with a gentle concave curvature to the neck of the scapula; a small process extends from the middle of this curvature. In the Potoroos the upper *costa* is at first parallel with the lower; but this parallel part is much shorter; the remainder describes a sigmoid flexure as it approaches the neck of the scapula. In the Great Kangaroo, the Perameles, Phalangers, Opossums and Dasyures, the whole upper *costa* of the scapula describes a sigmoid curve, the convex posterior portion of which varies as to its degree and extent.

"The subscapular surface is remarkable in the Perameles for its flatness; but presents a shallow groove near the inferior *costa*. In most other Marsupials it is more or less convex and undulating.

"In the Great Kangaroo the *supraspinal fossa* is of less extent than the space below the spine, and the spine is inclined upwards. In the Perameles and Dasyures the proportions of the *supra* and *infra* spinal surfaces are reversed, and the whole spine is bent downwards over the *infraspinal* surface. In the Potoroos

and Phalangers the acromion is, as it were, bent downwards, so as to present a flattened surface to the observer. In the Potoroos and Opossums this appearance is produced by a true expansion of the acromion. In the Perameles the coracoid process is merely represented by a slight production of the superior part of the glenoid cavity. In the Kangaroo and Potoroos it forms a protuberance on the upper part of the head of the scapula. In the other *Marsupiata* it assumes the character of a distinct process from the same part; and attains its greatest development in the Wombat and Koala, in the latter of which it is forcibly curved downwards and inwards.

"The *humerus* in the Dasyures and Thylacine resembles that of the dog-tribe, in the imperforate condition of the inner condyle, but differs in the more marked development of the muscular ridges, especially that which extends upwards from the outer condyle, for the origin of the great supinator. This ridge is terminated abruptly by the smooth tract for the passage of the musculo-spiral nerve. In *Phal. Cookii* the internal condyle is imperforate, and in *Petaurus Sciureus* it is deeply notched; but in other Phalangers and Petaurists, as also in all the other genera of Marsupials, the internal condyle of the *humerus* is perforated.

"The ridge above the external condyle is much developed in the *Petaurus macrurus* and *P. sciureus*, and notched at its upper part; there is the same structure in *Phal. Vulpina*, but it does not exist in *Phal. Cookii*. I find similar differences in the development of the supinator or outer ridge in the genus *Perameles*; in the *Per. lagotis* it is bounded above by a groove; in *Per. grisea* it is less developed and less defined. In the Kangaroos, Potoroos, Wombat and Koala, the outer condyloid ridge extends in the form of a hooked process above the groove of the radial nerve. In all these, and especially in the Wombat, the deltoid process of the *humerus* is strongly developed; it is continued from the external tuberosity down the upper half of the *humerus*; except in the Petaurists, where, from the greater relative length of the *humerus*, it is limited to the upper third. The interspace of the condyles is occasionally perforated, as in the *Perameles lagotis* and Wombat. The articular surfaces at both extremities of the *humerus* have the usual form; but it may be observed, that in some Marsupials, as the Koala, the external convexity at the distal articulation for the radius has a greater relative extent than usual, and the ulnar concavity is less deep.

"The bones of the fore-arm present little to detain our notice. They are always distinct and well-developed, and their adaptation to pronation and supination is complete. The prehensile faculty and unguiculate structure of the anterior extremities appear to have been indispensable to animals requiring to perform various manipulations in relation to the œconomy of the Marsupial pouch, and when such an animal is destined, like the Ruminant, to range the wilderness in quest of pasturage, the requisite powers of the anterior members are retained and secured to it by an enormous development of the hinder extremities, to which the function of locomotion is almost restricted.

"We find, therefore, that the bones of the fore arm of the Kangaroo differ little from those of the burrowing Wombat, the climbing

Koala, or the carnivorous Dasyure, save in relative size. They present the greatest proportional strength in the Wombat, and the greatest proportional length and slenderness in the Petaurists or Flying Opossums, in which the extremities are subservient to the support of a dermal parachute. They are also long and slender in the Koala. In general the radius and ulna run nearly parallel, and the interosseous space is very trifling: it is widest in the Potoroos. The olecranon is well developed in all the *Marsupiata*. In the Virginian Opossum and Petaurists, we find it more bent forwards upon the rest of the ulna, than in the other Marsupials. In the Wombat, where the acromion is the strongest, and rises an inch and a half above the articular cavity of the ulna, it is extended in the axis of the bone. The distal end of the radius in this animal is articulated to a broad bone representing the *os scaphoides* and *os lunare*. The ulna, which in the same animal converges towards a point at its distal end, has that point received in a depression formed by the cuneiform and pisiform bones; these are bound together by strong ligaments; and the latter then extends downwards and backwards for two-thirds of an inch. The second row of the *carpus* consists of five bones. The *trapezium* supports the inner digit, and has a small sesamoid bone articulated to its radial surface. The *trapezoides* is articulated to the index digit, and is wedged between the *scapholunar* bone and *os magnum*; this forms an oblique articular surface for the middle digit; but the largest of the second series of carpal bones is the cuneiform, which sends downwards an obtuse rounded process, and receives the articular surface of the fifth and the outer half of that of the fourth digit; the remainder of which abuts against the oblique proximal extremity of the middle metatarsal bone. The five metatarsal bones are all thick and short, but chiefly so the outermost.

"The innermost digit has two phalanges, the remainder three; the ungueal phalanx is conical, curved, convex above, expanded at the base, and simple at the opposite extremity. In the Perameles the ungueal phalanx of the three middle digits of the hand, and of the two outer digits of the foot, are split at the extremity by a longitudinal fissure, commencing at the upper part of the base. This structure, which characterizes the ungueal phalanges in the placental Pangolins, has not been hitherto met with in other marsupial genera. It would be interesting to examine the skeleton of the newly described genera *Myrmecobius* and *Chæropus* with reference to this structure.

"The terminal phalanges of the Koala are large, much compressed, and curved; the concave articular surface is not situated, as in the cats, on the lower part of the proximal end, but, as in the sloths, at the upper. The claws which they support are long.

"In the great Kangaroo the first row of the *carpus* is composed, as in the Wombat, of three bones; but the apex of the ulna rotates in a cavity formed exclusively by the cuneiforme. There are four bones in the second row, of which the cuneiform is by far the largest, and supports a part of the middle, as well as the two outer digits. In Potoroos I find but three bones in the distal series of the *tarsus*, the *trapezoides* being wanting, and its place in one species being

occupied by the proximal end of the second metatarsal bone, which articulates with the *os magnum*. In the Perameles there are four bones in the distal series, although the hand is less perfect in this than in any other marsupial genus, the three middle toes only being fully developed. In the Petaurists, the *carpus* is chiefly remarkable for the length of the *os pisiforme*. It would be tedious to dwell on the minor differences observable in the bony structure of the hand in other Marsupiata. I shall therefore only observe that, though the inner digit is not situated like a thumb, yet that the fingers enjoy much lateral motion; and that those at the outer can be opposed to those at the inner side, so as to grasp an object and perform in a secondary degree the function of a hand. In the Koala the two inner digits are more decidedly opposed to the three outer ones than in any other climbing Marsupial. But some of the Phalanges, as the *Ph. Cookii* and *Ph. gliriformis* of Bell, present in a slight degree the same dispositions of the fingers, by which two out of the five have the opposable properties of a thumb—a structure for which we seek in vain among the placental Mammalia, but which we have repeated in the prehensile extremities of the Chameleon.

"The pelvis in the mature Marsupial is composed of the *os sacrum*, the two *ossa innominata*, and the characteristic supplemental bones attached to the pubes, called by Tyson the *ossa marsupialia*, or *Janitores marsupii*.

"We seek in vain for any relationship between the size of the pelvis and that of the new-born young, the minuteness of which is so characteristic of the present tribe of animals. The diameters both of the area and the apertures of the pelvic canal are considerable, but more especially so in those Marsupialia which have the hinder extremities disproportionally large, as also in the Wombat, where the pelvis is remarkable for its width. The pelvis is relatively smallest in the Petaurists. The anterior bony arches formed by the *ossa pubis* and the *ischia* are always complete; and the interspace between these arches is divided, as in other Mammalia, into the two *obturator foramina*, by an osseous bridge continued from the *pubes* to the *ischium* on each side of the *symphysis*.

"In the Kangaroos, Potoroos, Phalangers, and Opossums, the *ischia* offer an elongated prismatic form. They are straight in the Opossum, but gently curved outwards in the other marsupial genera. In the Dasyures there is a longitudinal groove widening upwards in place of the angle at the middle of the exterior surface of the *ilium*.

"The *ilia* in the Petaurists are simply compressed from side to side. They are broader and flatter in the Perameles, and their plane is turned outwards. But the most remarkable form of the *ilia* is seen in the Wombat, in which they are considerably bent outwards at their anterior extremity.

"In the Kangaroos and Potoroos the eye is arrested by a strong process given off from near the middle of the ilio-pubic ridge; and this process may be observed less developed in the other Marsupiata.

"The tuberosity of the *ischia* inclines outwards in a very slight degree in the Dasyures, Opossums, Phalangers, Petaurists, and Pe-

rameles; in a greater degree in the Kangaroos and Potoroos; and gives off a distinct and strong obtuse process in the Wombat, which not only extends outwards but is curved forwards. In the Potoroos the *symphysis* of the *ischia* or the lower part of what is commonly called the *symphysis pubis*, is produced anteriorly. The length of this *symphysis*, and the straight line formed by the lower margin of the *ischia*, is a characteristic structure of the *pelvis* in most of the Marsupiata.

"The marsupial bones are elongated, flattened, and more or less curved, expanded at the proximal extremity, which sometimes, as in the Wombat, is articulated to the *pubis* by two points; they are relatively longest, straightest, and most slender in the Perameles; flattest, broadest, and most curved in the Koala. They are always so long that the cremaster muscle winds round them in its passage to the testicle or mammary gland; and the uses of these bones immediately relate to those muscles.

"With reference to the interesting question—What is the homology or essential nature of the ossa marsupialia? I have, on a previous occasion, discussed that problem before the Zoological Society, and have not found reason to change the opinion I offered in 1835*; *viz.* that they belong to the category of the trochlear ossicles, commonly called, sesamoid, and are developed in the tendon of the external oblique which forms the mesial pillar of the abdominal ring, as the patella is developed in the *rectus femoris*. They are not, however, merely subservient to add force to the action of the 'cremasteres,' but give origin to a great proportion of the so-called 'pyramidales.'

"The *osteogenesis* of the marsupial pelvis derives some extrinsic interest from the not yet forgotten speculations which have been broached regarding the analogies of the marsupial bones. These have been conjectured to exist in many of the placental Mammalia, with a certain latitude of altered place and form, disguised, e. g. as the bone of the *penis* in the Carnivora, or appearing as the supplemental ossicles of the acetabulum, which exist in the young of many of the Rodentia. In the os innominatum of the immature Potoroo, the curved prismatic *ilium* contributes to form by the outer part of its base the upper or anterior third of the acetabulum; the rest of the circumference of this cavity is completed by the *ischium* and *pubis*, excepting a small part of the under or mesial margin, which is formed by a distinct ossicle or epiphysis of the ilium, analogous to that described by Geoffroy St. Hilaire as the rudimental marsupial bone in the rabbit. Now here there is a co-existing marsupial bone: but besides the five separate bones just mentioned, there is a sixth distinct triangular ossicle, which is wedged into the posterior interspace of the ischio-pubic

* See the abstract of a Paper on the analogy of the *Dasyurus*, Proc. Zool. Soc., January 1835, in which the discussion of the question of the marsupial bone is abridged in the following words: "and Mr. Owen stated it to be his opinion, that the marsupial bones are essentially ossifications of the tendons of the external abdominal muscle which constitute the internal or mesial pillars of the abdominal rings." The same hypothesis is again advanced in the account of the anatomy of the Wombat. Pro. Zool. Soc. 1836, p. 19.

symphysis. How easy to suggest that this single symmetrical bone may be the representative of the *os penis* removed from the glans to the root of the intromittent organ! It is obviously a mere epiphysis of the ischium. The circumference of the acetabulum is always interrupted by a deep notch opposite the obturator-foramen, which is traversed by a ligamentous bridge, and gives passage to the vessels of the Harderian gland lodged in the wide and deep acetabular fossa.

"The femur is a straight or nearly straight long cylindrical bone, having a hemispherical head supported on a very short neck, especially in the Petaurists, and situated here almost in the axis of the shaft, above and between the two trochanters, which are nearly of equal size. In the Kangaroos and Potoroos the head of the thigh bone is turned more inwards, and the outer or great trochanter rises above it. In other Marsupiata the great trochanter is less developed. In all a strong ridge is continued downwards to a short distance from the trochanter; and this ridge is so produced at the lower part in the Wombat as almost to merit the name of a third trochanter.

"In the Wombat and Koala there is no depression for a *ligamentum teres* which nevertheless exists in the latter.

"The shaft of the bone presents no *lineæ asperæ*. The canal for the nutrient artery commences at the upper third and posterior part of the bone in the Koala, and extends downwards, contrarywise to that in man and most other Mammalia. At the distal extremity of the femur the external condyle is the largest, the internal rather the longest. The intermediate anterior groove for the patella is well marked in the Perameles where the patella is fully developed, but is broad and very shallow in the Phalangers and Dasyures, where the tendon of the *rectus* is merely thickened, or offers only a few irregular specks of ossification; and the corresponding surface in the Petaurists, Wombat and Koala, is almost plane from side to side. I find distinct but small bony patellæ in the *Macropus Bennettii*.

"The tibia presents the usual disposition of the articular surface for the condyles of the femur; but in some genera, as the Wombat and Koala, the outer articular surface is continuous with that for the head of the fibula. In the Kangaroos and Potoroos the anterior part of the head of the tibia is much produced; and in the young animal its ossification commences by a centre distinct from the ordinary proximal epiphysis of the bone. A strong ridge is continued down from this protuberance for about one sixth the length of the tibia. In the Koala a strong tuberosity projects from the anterior part of the tibia at the junction of the upper with the middle third. In this species, and in the Wombat, as also in the Opossums, Dasyures, Phalangers, and Petaurists, the shaft of the tibia is somewhat compressed and twisted; but in the Kangaroos, Potoroos, and Perameles, the tibia is prismatic above and subcylindrical below. The internal malleolus is very slightly produced, perhaps most so in the Wombat.

"The fibula is complete, and forms the external malleolus in all the Marsupiata. In one species of Hypsiprymnus, and in one species of Perameles, it is firmly united to the lower part of the tibia, though the

line of separation be manifest externally. In a second species of each of the above genera it is in close contact with the corresponding part of the tibia, but can be easily separated from that bone. In the great Kangaroo the fibula is also a distinct bone throughout, but it is remarkably thinned and concave at its lower half, so as to be adapted to the convexity of the tibia, with which it is in close contact. In each of these genera therefore, in which locomotion is principally performed by the hinder extremities, fixity and strength is gained by the structure of the bones of the leg. In the other genera, as *Phascolarctos*, *Phascolomys*, *Phalangista*, *Petaurus*, *Didelphis*, and *Dasyurus*, the tibia and fibula are so connected together, and with the tarsus, that the foot enjoys a movement of rotation analogous to the pronation and supination of the hand; and in the Petaurists, Phalangers, Opossums, and Koala, the inner toe is so placed and organized as to perform the office of an opposable thumb, whence these Marsupiata have been termed pedimana or foot-handed. It is to this prehensile power that the modifications of the fibula chiefly relate. In the Wombat, Koala, Petaurists, and Phalangers it expands to nearly an equal size with the tibia at the distal extremity, and takes a large share in the formation of the tarsal joint; but the articular surface is slightly convex, while that of the tibia is slightly concave. The proximal extremity of the fibula is also much enlarged, but compressed, obliquely truncated, and giving off two tuberosities from its exterior surface; to the superior of these a large sesamoid bone is articulated; we observe the same sesamoid attached to the upper end of the fibula in a *Dasyurus macrurus*. Temminck figures it in the *Phalangista ursina* and *Didelphis Philander*.

"This enlarged and elevated proximal end of the fibula, with its superimposed sesamoid, obviously represents the *olecranon* of the *ulna*, and beautifully illustrates and establishes the analogies long ago pointed out between the radius and tibia, the ulna and fibula, by my revered preceptor in anatomy, Dr. Barclay *.

"I find the following structure of the tarsus in the Wombat. The astragalus is connected as usual with the tibia, fibula, calcaneum and scaphoides. The upper articular surface for the tibia is as usual concavo-convex, the internal surface for the inner malleolus flattened, and at right angles with the preceding. But the outer articular surface presents a triangular flattened form; and instead of being bent down parallel with the inner articulate surface, slopes away at a very open angle from the upper surface, and receives the articular surface of the fibula, so as to sustain its vertical pressure. A very small proportion of the outer part of the inferior surface of

* See his admirable 'Description of the Arteries of the Human Body,' pp. 258, 259, and his 'Explanations of Mitchell's Engravings of the Bones, 4to., Edin. 1824, Expl. of Pl. xxiv.' Both Dr. Barclay's analogies of the bones of the atlantal and sacral extremities, and my hypothesis of the nature of the marsupial bones, have been reproduced in the past year as novel discoveries, by two French anatomists; the one by Dr. Flourens in an interesting and ingenious paper in the 'Annales des Sciences Nat., Oct. 1838,' the other by M. Gervais in the '*Zoologie de la Favorite*,' *Partie III. p.* 100.

the astragalus rests upon the calcaneum: a greater part of the superincumbent pressure is transmitted by a transversely extended convex anterior surface to the scaphoid and cuboid bones. This form of the astragalus is also characteristic of the Koala, Petaurists, Dasyures, and the Pedimanous Marsupials. In the Kangaroos, Potoroos, and Perameles which have the *pedes saltatorii*, the fibular articular surface of the astragalus is bent down as usual, at nearly right angles with the upper tibial surface. The calcaneum presents a ridge on the outer surface which serves to sustain the pressure of the external malleolus, which is not articulated to the side of the astragalus. The internal surface which joins the astragalus is continuous with the anterior slightly concave surface which articulates with the cuboides. The posterior part of the bone is compressed; it projects backwards for nearly an inch, and is slightly bent downwards and inwards. This part is relatively shorter in the Koala, Phalangers, Opossums, and Petaurists; but is as strongly developed in the Dasyures as in the Wombat. In the *Dasyurus macrurus*, I observe a small sesamoid bone wedged in between the astragalus, tibia, and fibula, at the back part of the joint. In the *Petaurus taguanoides*, there is a supplemental tarsal bone wedged in between the naviculare and cuboides in the plantar surface. In the Wombat the scaphoid, cuboid, and the three cuneiform bones, have the ordinary uses and relative positions.

"The analogy of the carpal and tarsal bones is very clearly illustrated in this animal. The anchylosed *naviculare* and *lunare* of the hand correspond with the astragalus and naviculare of the foot, transferring the pressure of the *focile majus* upon the three innermost bones of the second series. The long backward projecting pisiform bone of the wrist closely resembles the posterior process of the *os calcis*; the articular portion or body of the *os calcis* corresponds with the cuneiform; the large unciform represents the cuboides, and performs the same function, supporting the two outer digits. the three cuneiform bones are obviously analogous to the *trapezium*, *trapezoides*, and *os magnum*. The internal cuneiforme bone is the largest of the three in the Wombat, although it supports the smallest of the toes. It is of course more developed in the Pedimanous Marsupials, where it supports a large and opposable thumb. In the Wombat the metatarsals progressively increase in length and breadth from the innermost to the fourth; the fifth or outermost metatarsal is somewhat shorter, but twice as thick, and it sends off a strong obtuse process from the inside of its proximal end. The innermost metatarsal supports only a single phalanx; the rest are succeeded by three phalanges each, progressively increasing in thickness to the outermost; the ungueal phalanges are elongated, gently curved downwards, and gradually diminish to a point. In the Dasyures the innermost toe has two phalanges, but it is the most slender, and does not exceed in length the metatarsal bone of the second toe. In the Petaurists it is rather shorter than the other digits, but is the strongest; the toes are set wide apart in this genus. In the Opossums and Phalangers the inner metatarsal bone is directed inwards apart from the rest, and together with the first phalanx, is broad and

flat. The second phalanx in the Opossum supports a claw, but in the Phalangers is short, transverse, unarmed, and almost obsolete.

"In all the preceding genera there are two small sesamoid bones on the underside of the joints of the toes, both on the fore and hind feet.

"The commencement of a degeneration of the foot, which is peculiar to, and highly characteristic of, the Marsupial animals, may be discerned in the Petaurists, in the slender condition of the second and third toes, as compared with the other three. In the Phalangers, this diminution of size of the second and third toes, counting from the thumb, is more marked. They are also both of the same length, and have no individual motion, being united together in the same sheath of integument as far as the ungueal phalanges, whence the name of *Phalangista* applied to this genus. In the saltatorial genera of Marsupiata the degradation of the corresponding toes is extreme, but though reduced to almost filamentary slenderness, they retain the usual number of phalanges, the terminal ones being armed with claws, which appear as appendages at the inner side of the foot, for the purpose of scratching the skin and dressing the fur. In the Kangaroos and Potoroos the innermost toe is deficient, but in the *Perameles* it is retained. In *Per. lagotis* I find the metatarsal bone of this toe supports only a single rudimental phalanx, which reaches to the end of the next metatarsal bone, and the internal cuneiform bone is elongated. In *Per. grisea* the internal toe is as long as the abortive second and third toes, and has two phalanges, the last of which is divided by the longitudinal fissure characteristic of the ungueal phalanges in this genus. The power of the foot is concentrated in all these genera on the two outer toes, but especially the fourth, which in the great Kangaroo is upwards of a foot in length, including the metatarsal bone and the claw, which latter resembles an elongated hoof, but is three-sided, and sharp-pointed like a bayonet. It is with this formidable weapon that the Kangaroo stabs and rips open the abdomen of its assailant; it will hold a powerful dog firmly during the attack with the anterior extremities, and supporting itself behind upon its powerful tail, deliver its thrusts with the whole force of the hinder extremities. The cuboid bone which supports the two outer metatarsals in the Kangaroo is proportionally developed. The internal cuneiform bone is present, though the toe which is usually articulated to it is wanting. It is also the largest of the three, and assists in supporting the second metatarsal; behind it is joined with the naviculare and external cuneiform; the small middle cuneiform occupying the space between the external and internal wedge-bones and the proximal extremities of the two abortive metatarsals. The great or fourth metatarsal is straight and somewhat flattened; the external one is compressed and slightly bent outwards; the toe which this supports is armed with a claw similar to the large one, but the ungueal phalanx does not reach to the end of the second phalanx of the fourth toe, and the whole digit is proportionally weaker."

November 13, 1838.

Professor Owen, in the Chair.

A letter was read from G. Burghall Watts, Esq., Corr. Memb. Z.S., addressed to William Yarrell, Esq., stating that a collection of specimens from the neighbourhood of Turbaco, South America, was on the way to England for the Society's Museum.

A letter from Alexander Gordon, Esq. was also read, begging the Society's acceptance of the animal described by Mr. Waterhouse under the name of *Myrmecobius fasciatus*, and also the *Perameles lagotis*. Both of these animals, Mr. Gordon stated, were from Swan River and not from Van Diemen's Land as had been supposed.

A paper entitled "Observations on certain modifications observed in the dentition of the Flying Opossums (the genus *Petaurus* of authors)," was communicated by Mr. G. R. Waterhouse.

"In the '*Dents des Mammifères*' of M. F. Cuvier, the dentition of the Flying Opossums and that of the Phalangers is described under the two heads '*Petaurus*' and '*Phalangers proprement dits*.' Both the groups termed *Petaurus* and *Phalangers* by M. F. Cuvier contain certain species of Flying Opossums, and likewise species of Phalangers. Those species, however, which have the flank-membrane extended from limb to limb, enabling them to sail in the air like a parachute, are now with universal consent separated from the Phalangers (*Phalangista*), and arranged under the generic title Petaurus or Petaurista.

"In grouping the Phalangers and Petaurists as above mentioned, M. F. Cuvier was guided only by the characters offered by the dentition; that of *Petaurus Taguanoides* certainly bearing a very close resemblance to that of *Phalangista Cookii*. The teeth of *Petaurus sciureus*, however, do not bear so close a resemblance to those of *Phalangista vulpina* and *P. maculata*, although the three animals mentioned are placed in the same division by the author alluded to. Regarding the Petauri as a distinct genus from the Phalangers, I will proceed to describe their dentition as I find it in the skulls before me, which I may observe consist of two specimens of each of the following species:—*P. taguanoides*, *P. flaviventer*, *P. sciureus*, and *P. pygmæus*, and one skull of a new species hereafter described.

"In these *crania* three distinct modifications in the dentition are observable; and as they are combined with certain differences in the skulls and in the external characters of the animals to which they belong, they may be regarded as forming three subordinate sections, to which for convenience I shall apply the names, *Petaurus*, *Belideus*, and *Acrobata*. Two of these names will be found in the 'Mammologie,' by M. Desmarest. The dentition observable in the species of

the first of these sections (*Petaurus*) is as follows:—Incisors $\frac{6}{2}$; canines $\frac{1-1}{0-0}$; false molars $\frac{3-3}{1-1}$; true molars $\frac{4-4}{4-4}$ I am induced to call the two first teeth following the incisors canines, since they represent those which are *evidently* canines in the two next sections. The incisors of the upper jaw are arranged laterally, the three on either side being placed close together; the two foremost are separated from one another by a space about equal to their diameter; they are narrow at the base, and expanded and somewhat compressed above the base. The next incisor on each side is larger than the last or posterior one, and about half the height of the first, narrow at the base, and wide and truncated at the apex. The third incisor is small and but slightly wider at the tip than at the base. The canine is very small, being in size about equal to the posterior incisor; its tip is rounded, and it springs from the maxilla a little behind the intermaxillary suture; the space between it and the canine being about equal to twice its diameter or more; for there is a difference in this respect in the specimens before me. The first false molar is minute and conical, separated by a considerable space from the canine and also from the following molars. The next two molars on each side I have called false molars, because they do not possess the inner tubercles which are observed in those behind; they are broad at the base and compressed at the tip; the foremost presents an anterior larger, and a posterior small compressed tubercle; the third is divided at the tip into three compressed points. The true molars are nearly square, but rather longer than broad; the crown of each, with the exception of the last, presents four tubercles, with sharp cutting edges, and very much resemble those of a Ruminant animal. In the last molar there are but three of these tubercles, two in front and one behind. The incisors of the lower jaw are large, nearly cylindrical at the base; beyond this they are somewhat dilated, flattened, pointed, and have two sharp edges. There are no minute detached false molars in the lower jaw. The single false molar on each side is placed close to the true molars, compressed in front and expanded behind; a small anterior tubercle is separated from the body of the tooth by a slight transverse incision. The true molars resemble those of the upper jaw, excepting that they are narrower, and the last molar has four tubercles instead of three.

"The above description is taken from *P. Taguanoides*. The *cranium* differs from that of the species of the second section (*Belideus*) in being proportionately smaller, more contracted, and deeply concave between the orbits; the cranial cavity is smaller, the zygomatic arches deeper, and the bony palate is deeply emarginated posteriorly; in fact, the palatine portion of the palatine bone is wanting. The dense woolly fur on the outer side of the ears will serve to distinguish the animal externally from either of the species of the next subgenus. *P. macrourus* I suspect belongs also to this section. In M. F. Cuvier's 'Dents des Mammifères,' it is stated, that besides the false molars described by me there are two others on each side, which are small;—these I have not seen, nor are they shown in the plate of the work quoted. Perhaps they are shed at an early pe-

riod, or perhaps M. Cuvier may have described the dentition of *Phalangista Cookii* and figured that of *Petaurus Taguanoides*.

"Section 2. *Belideus*.—Dentition: Incisors, $\frac{6}{2}$; canines, $\frac{1-1}{0-0}$; false molars, $\frac{3-3}{4-4}$; true molars, $\frac{4-4}{4-4}=40$. The anterior incisors of the upper jaw are large, somewhat suddenly dilated immediately above their insertion in the intermaxillaries, and assuming a triangular form. In *P. flaviventer* they are broader than in either *P. sciureus* or the new species here described under the specific name of *breviceps*, where these incisors are proportionately shorter, and perhaps a little broader than in *P. sciureus*. The next incisor on each side is smaller than the posterior one, narrow at the base, and broad at the apex. The third incisor is broad, and has a sharp incurved cutting edge. The canine is tolerably large, and has its origin close behind the intermaxillary suture; in fact, is in the usual situation of the canine. It is separated by a small space on either side from the false molars and the incisors, compressed and pointed, and its anterior and posterior edges are sharp. The apex projects beyond the level of either of the molars. The first false molar on each side is rather large, broad, compressed and pointed, has a very faint indication of an anterior and posterior lobe, and two distinct fangs (which is not the case in the small and cylindrical corresponding tooth in *Petaurus Taguanoides*). The second false molar is small, short, and compressed, and has a minute anterior lobe. This tooth is separated by a considerable space from the first false molar, and by a narrow space from the third. The latter touches the first true molar, is narrow in front, and consists chiefly of one triangular and pointed tubercle. The first true molar on each side is considerably larger than the following molars, each of which is smaller than the preceding, so that the last is not equal in bulk to one half of the first. With the exception of the last, all the true molars possess four somewhat blunt and rounded tubercles, and in general appearance very much resemble the corresponding teeth of a Squirrel. The last molar has but three tubercles, two in front and one behind.

"The incisors of the lower jaw are long, compressed, and pointed, and have the upper and lower edges sharp; they are almost horizontal in their direction, being but slightly curved upwards. Next follows a series of four small teeth on each side, which I have called false molars, though possibly the last only is properly so called, that having two fangs, whereas the others appear to have but one. The true molars nearly resemble those of the upper jaw, though they are narrower and longer. The first has a large irregular anterior lobe, which is higher than the posterior portion of the tooth, which is divided into two tubercles. The three posterior molars have each four tubercles.

"Besides the points of distinction already alluded to between the species of the present section and the preceding, there are other characters which cannot be considered unimportant. The space occupied by the grinding teeth of the upper jaw, compared with the space between the last incisor and the first true molar in the species of

Belideus, is much less than in Petaurus. In Belideus the molars occupy a space equal to rather more than two-thirds of that between the incisors and first true molar; whereas in Petaurus, the four last molars occupy more space than that which extends from them to the incisors. There is a corresponding difference in the lower jaw. In Petaurus the molars are very nearly equal in size, whereas in Belideus they decrease considerably from the first molar to the last. In Petaurus, again, there are five molars on each side of the lower jaw opposed to six in the upper jaw, all of which are fitted for the mastication of the food; whilst in Belideus the molar corresponding to the first on either side of each jaw in Petaurus is so small, and its crown is so low, that it cannot be used in mastication. The comparatively large size of the canines, and the series of small teeth in front of the molars, will also serve to distinguish the species of the present section from the preceding, where the upper margin of the *ramus* of the lower jaw somewhat suddenly descends in front of the molars, and the coronoid process is comparatively broad.

"*Petaurus sciureus* may be regarded as the type of the section *Belideus*, which will also contain *P. flaviventer* and *P. breviceps*.

"In the third section, which is the subgenus *Acrobata* of Desmarest, the incisors are $\frac{6}{2}$; canines, $\frac{1-1}{0-0}$; false molars, $\frac{3-3}{4-4}$; true molars, $\frac{3-3}{5-3}=36$. The incisors resemble those of Belideus; the canines are well-developed, long, pointed, and recurved, placed close to the intermaxillary suture, and even encroaching slightly on the intermaxillary bone. The three false molars of the upper jaw have each two fangs, they are compressed, sharply pointed, and viewed laterally, of a triangular form. The first and second are about equal in size, and larger than the third, the apex of which projects beyond the level of the crowns of the true molars. Between the first and second false molars on each side there is a narrow space; the third is placed close to the true molars; these as well as those of the under jaw resemble the true molars of Belideus; there is however one less on each side of both jaws. The incisors of the lower jaw also resemble those in Belideus. Behind these incisors there are two minute teeth on each side, which are followed by two sharply pointed false molars, the foremost of which is the larger, and the apex of the second is raised above the plane of the true molars.

"The difference in the form of the false molar teeth pointed out, together with the reduced number of true molars, the slenderness of the zygomatic arch, and the incurved angle of the lower jaw, combined with the imperfect state of the palate, will serve to distinguish the species of the present section from the preceding. Externally, the *P. pygmæus* (which is the type of M. Desmarest's subgenus) may be distinguished by its distichous tail.

PETAURUS BREVICEPS. *P. cinerea, lineâ dorsali longitudinali membranâque laterali suprà nigrescentibus, hac ad latera albâ; corpore subtùs sordidè et pallidè cinereo: caudâ gracili, ad apicem fuliginosâ; auribus mediocribus.*

	unc.	lin.
Longitudo ab apice rostri ad caudæ basin	6	6
——— *caudæ*	7	0
——— *tarsi digitorumque*	1	1
——— *auris*	0	9

Habitat New South Wales.

"This species very much resembles the *P. sciureus* in colouring; the under parts, however, have a distinct grayish tint: the dark mark which extends from the tip of the nose along the back is indistinct. It is of a much smaller size than *P. sciureus*, the tail is much more slender, and occasionally has a white tip. The skull is proportionately broader and shorter than that of *P. sciureus*, as will be seen in the following dimensions."

	P. breviceps.		*P. sciureus.*	
	in.	lin.	in.	lin.
Total length of skull	1	$3\frac{1}{2}$	1	10
Length of nasal bones.....	0	$5\frac{1}{3}$	0	$7\frac{1}{2}$
Length of frontal....	0	$6\frac{1}{4}$	0	$8\frac{1}{2}$
Length of palate	0	8	0	$11\frac{1}{3}$
Width of skull	1	0	1	$2\frac{1}{4}$

Mr. Waterhouse then proceeded to point out some peculiarities in the skull and dentition of the American Badger (*Meles Labradoria*). Three skulls of this species, belonging to individuals of different ages, were exhibited to the Meeting. "The most striking peculiarity in the skull of the American Badger," observes Mr. Waterhouse, "consists in the great expanse of the occipital region; the width of the occiput being equal to that of the skull measured from the outer surface of the zygomatic arches. The general form of the skull is almost conical; viewed laterally, the outline of the upper surface is most elevated at, or very near the occiput; thence it runs downwards with a slightly convex curve to the nasal bones. The interorbital portion is considerably contracted, and is narrowest posteriorly. The occipital crest is well-developed, but the sagittal crest is very slightly elevated; in this respect differing from the corresponding ridge in the *Meles vulgaris*.

"The auditory *bullæ* are very large and convex. The articulating surface of the temporal bone, or glenoid cavity, like that of the Common Badger, has its anterior and posterior process; these processes, however, merely serve to prevent the protrusion or retraction of the lower jaw, and not to enclose and lock the condyle as in that animal. Comparing the lower jaw with that of the Common Badger, the most striking difference consists in the form of the coronoid process. The anterior margin of this process is less oblique than in the last-mentioned animal; its apex is somewhat pointed, whereas in the Common Badger it is rounded: the posterior margin is formed of two lines, an upper one, running backwards and downwards from the apex of the coronoid process, and a lower one, which is perpendicular, and forms an obtuse angle with the first. In this form of the coronoid

process we perceive a similarity between the American Badger and the Otter.

Dentition.—"In the number of the teeth the present animal agrees with the Common Badger, excepting that in the skulls now before me, and which belong to animals of different ages, I do not find the molar corresponding to the small first false molar of the lower jaw of that animal. In the relative size and form of the teeth there is much difference. The incisors of the upper jaw are arranged in an arch, but form together a segment of a larger circle than those of *Meles vulgaris*; they are proportionately smaller and shorter. In the canines there is but little difference; the posterior cutting edge observed in the Badger is here almost obliterated. The false molars likewise scarcely differ. In the '*carnassière*' and true molar, however, there is much difference, the former being of great size and equal to the last molar. It is nearly in the form of a right-angled triangle, the cutting edge is much raised, and there is a large tubercle on the inner lobe of this tooth, which has no analogue in the Badger. The true molar is also nearly triangular; the tubercles with which it is furnished are but slightly raised, and are much less developed than in the corresponding grinding molar of the Badger. The principal differences observable in the teeth of the lower jaw, consist in the smaller size of the incisors, the larger size of the last false molar, and its being furnished with two distinct tubercles at its apex; that of the Common Badger being simply pointed: the smaller size of the '*carnassière*,' which is not distinctly dilated posteriorly, as in the Badger, and the cutting edge being higher; the true molar is smaller.

"The '*carnassière*' of the lower jaw may be divided into two portions, that which is opposed to the '*carnassière*' of the upper jaw, and which is the cutting portion, having high sharp cusps; and that which is opposed to the true molar, which is the grinding portion. Now in the Common Badger (*Meles vulgaris*) the latter portion decidedly exceeds the former in bulk, whereas in the American Badger the reverse is the case, arising from the comparatively large size of the '*carnassière*' of the upper jaw, and smaller size of the true molar."

Mr. Waterhouse also pointed out other distinctions between the American Badger and the European species. Independent of the differences observable in the colouring and markings, the former may be distinguished by its muzzle being hairy at the tip, the fore limbs stouter, and the claws larger and stronger.

The peculiar form of the skull in the present animal, and the modifications in the dentition are such, as, in Mr. Waterhouse's opinion, would indicate a subgeneric rather than a specific distinction; and should his views be borne out by the discovery of other species agreeing essentially with the above animal, he suggested that the name *Taxidea* might be an appropriate title for the group.

Professor Owen exhibited to the Meeting two skulls of the full-grown Koala (*Lipurus cinereus*, Goldf., *Phascolarctos*, Bl.), and two of immature specimens of the same species, and demonstrated the

peculiarities of the *cranium*, and especially the condition of the *dental* system.

In both the adult *crania* the *dental formula* was as follows:

$$Incis.\ \frac{3-3}{1-1},\ canin.\ \frac{1-1}{0-0},\ præmol.\ \frac{1-1}{1-1},\ mol.\ \frac{4-4}{4-4} = 30:$$

it thus corresponds numerically with the formula of the genus *Hypsiprymnus*, and differs only in the absence of a few minute, inconstant, and functionless teeth from the dentition of many of the *Petaurists* and *Phalangers*. The true *molares* in the *Koala* are, however, relatively larger and stronger than in the *Potoroos* and *Phalangers*, yet present the same general structure; each molar is beset with four three-sided pyramids, the sharp apices of which soon become blunted by trituration, and the outer series in the upper grinders are the first to be worn down; the posterior grinder is a little smaller than the rest in the upper jaw; the true *molares* of the lower jaw are equal amongst themselves, but narrower than those of the upper jaw. The crowns of the *præmolares*, or false grinders, are subtriangular, broadest behind, compressed, and terminate in a cutting edge; those of the upper jaw have a ridge extended along the inner side of their base; they do not exceed in antero-posterior extent the crowns of the true grinders. The true *molares* of the upper jaw have four fangs; those of the lower jaw, and the *præmolares* in both jaws, have two fangs. The *canines* are situated close to the *maxillo-incisive* suture, distant from the *præmolares* half an inch; they are very small, and do not extend beyond the alveolar margin further than two lines; they terminate in an oblique cutting edge, and their simple fang is closed at its extremity. Two lines anterior to the *canines* begin the series of *incisors*, of which the four posterior ones are of the same size as the *canines*; the pair immediately behind the large anterior *incisors* have their crowns worn flat by the appulse of the two large *incisors* below. The two anterior *incisors*, upper jaw, are twice as long, and as broad and thick as the posterior ones; their crown is conical, slightly curved, subcompressed, beveled off obliquely to an anterior cutting edge, and having a partial coating of enamel, but differing from true *dentes scalpraii* in having the extremity of the fang contracted and closed. The two *incisors* of the lower jaw are longer, straighter, and more compressed than the corresponding pair above; the enamel is confined to the anterior and lateral surfaces of the crown; but this, though beveled off from behind forwards, terminates in a blunt apex by attrition against the small middle *incisors* of the upper jaw; the posterior surface of the crown is impressed with a narrow longitudinal groove. These *incisors*, like those above, are developed by a temporary pulp, and have the fang contracted and solidified. In this respect the *Koala* resembles the *Phalangers*, and differs from the *Potoroos*, which have the fang of the large anterior *incisors* open for the reception of a persistent pulp. In the compressed and sectorial structure of the *præmolares* of the *Koala*, we perceive, however, an evident transition to the characteristic form of these teeth in *Hypsiprymnus*; but in this genus the *præmolares* are still more compressed, and are remark-

able for their antero-posterior extent, which dimension becomes excessive in the arboreal *Potoroos* of New Guinea.

So far, therefore, as the affinities of a Marsupial quadruped are indicated by its teeth, the position assigned to the *Koala* by Latreille*, viz. next to the *Phalangers*, must be regarded as more natural than that which it occupies in the 'Règne Animal' of Cuvier, viz. between the *Kangaroos* and *Wombat*. From the *Kangaroos* the *Koala* differs in the presence of *canines* in the upper jaw; and still more so from the *Wombat*, which has neither *canines* nor posterior *incisors*; whereas the *Koala* not only closely resembles the *Phalangers* and *Petaurists* in the correspondence as to number, kind, and conformation of its teeth, as compared with the functionally developed teeth of those genera, but also agrees with them in the conformation of its digestive organs, having a simple stomach, and a very long cæcum. In the *Wombat*, on the contrary, the cæcum is short and wide, and has a vermiform appendage. Both the *Potoroos* and *Kangaroos* differ from the *Koala* and *Phalangers* in their large sacculated stomach and relatively shorter cæcum; but the *Potoroos*, in the comparative simplicity of this organ, as well as in the presence of superior canine teeth, have clearly the nearer affinity to the *Koala*. Since, moreover, the *Petaurists* have canines in both jaws like the *Phalangers*, while the *Koala* possesses them only in the upper jaw, the place of the *Petaurists* should be between the *Phalangers* and *Koala*, and not, as in Latreille's system, between the *Kangaroos* and *Potoroos*; and Professor Owen proposed to include the *Koala* with the *Phalangers* and *Petaurists* in one subdivision, and to join the *Potoroos* with the *Kangaroos* to form another and distinct primary group of Marsupialia.

* Familles Nat. du Règne Anim. p. 53.

November 27, 1838.

Lieut.-Colonel W. H. Sykes in the Chair.

Dr. Horsfield laid before the Meeting a series of Mammalia and Birds collected in India by John McClelland, Esq., Assistant Surgeon E.I.C.S., and proceeded to point out the characters of some which were undescribed.

A paper on the Fishes of the Deccan, illustrated with numerous coloured drawings, was read by Colonel Sykes.

"In submitting to the Society an account of the fishes of Dukhun," observes Colonel Sykes, "it will scarcely excite surprise, that out of 46 species described no less than 42 are new to science, since they are from a hitherto untrodden field, and from peculiar localities, on the great plateau of the Dukhun (Deccan), none of them coming from a less elevation than 1500 feet above the sea; many from near 2000 feet, and others from yet higher situations. The chief features in the collection are the paucity of orders to which the collection belongs, and the remarkable prevalence of the members of the families of *Siluridæ* and *Cyprinidæ*. There is but one apodal *Malacopterygian*, but 4 *Acanthopterygii*, and the whole of the rest of the fish belong to the order Abdominal Malacopterygians. Of the families there are only eight: *Percidæ*, *Scombridæ*, '*Pharyngiens Labyrinthiformes*,' *Gobiadæ*, *Siluridæ*, *Cyprinidæ*, *Esocidæ*, and *Murænidæ*, comprising 15 genera and 9 subgenera, including one subgenus, which I have been compelled to add to the *Cyprinidæ*. An attempt has been made to methodize and distinguish the multitudinous members of the families of *Siluridæ* and *Cyprinidæ*. The fact is, the continued inosculation in the character of the teeth, of the *cirri*, of the spines (serrated or not) of the fins, the armature of the head, and the position of the fins in the *Siluridæ*; and the number of *cirri*, and form and position of the fins in the *Cyprinidæ*, together with the character of the mouth, produce such approximations in species to each other, and in individuals of one genus to another, that not only is there infinite difficulty in determining the genera of the fishes of these families, but their identity as species is occasionally not less difficult. Some of my *Siluridæ* do not exactly correspond with the generic characters of the genera of this family as now constituted, and I might have added to the number of genera; but to this I have an objection, unless as an evidently necessary measure. In the *Cyprinidæ*, however, I was obliged to set aside my repugnance, for three species were not referrible to any one even, of the numerous subgenera which Buchanan Hamilton wished to establish. It only remains to state that the whole of my fishes were drawn from absolute measurement, and have a scale of size attached to each figure; they were caught in the various rivers on whose banks I encamped, as individuals were required; so that my draftsman, who worked constantly under my own eye, never had to finish his drawings from shriveled and

discoloured specimens. I have to a great extent adopted the names by which the fishes are called by the Mahrattas as specific names, so that naturalists who travel the country can always obtain them.

Ord. Acanthopterygii.

Fam. Percidæ.

Ambassis, Agass.

Amb. Barlovi, Sykes. An *Ambassis* with the two back fins united, with the first ray indented on the edge, and containing 7 spines, and the second 14 spines; all the spines longer than the membrane, with 18 rays longer than the membrane in the anal fin, and with a short vertically compressed diaphanous body.

Closely allied to *Changa Ranga* of Hamilton. 'Fishes of the Ganges.' This fish is dedicated to our Secretary.

Fam. Scombridæ.

Mastacembelus, Gron.

Mast. armatus, Sykes. A *Mastacembelus* with the fins of the tail, back, and vent united, with thirty-nine to forty short sharp bony spines along the back, and two behind the vent.

This fish has not the exact generic characters of *Macrognathus*, *Mastacembelus*, or *Notacanthus*, and might probably constitute a genus between the two last.

Fam. 'Pharyngiens Labyrinthiformes,' Cuv.

Ophicephalus, Bloch.

Oph. leucopunctatus, Sykes. An *Ophicephalus* with from 51 to 53 rays in the dorsal, and 6 in each ventral fin, and with the rays of the dorsal and anal fins undivided; the pectoral fins ending in a central point, and the fish covered with white dots.

I have never known this remarkably fine fish crawl on shore or in the grass, as some species of the genus are said to do. It is excellent eating.

Fam. Gobiadæ.

Gobius, Linn.

Gob. Kurpah, Sykes. A *Gobius* with 7 rays in the first dorsal fin, 11 in the second, which is of similar size with the anal fin; 19 in the pectoral, and 10 in the anal fin.

In different individuals of this species I have found the number of rays in the fins slightly differ. Of a sweet flavour.

Ord. Malacopterygii Abdominales.

Fam. Cyprinidæ.

Cyprinus, Linn.

Cyp. Abramioides, Sykes. A *Cyprinus* with 20 rays in the dorsal, 8 in the anal, and 18 in the pectoral fins, without tendrils, with tuberculated nose, red edged fins, and with a red lunule on each scale.

This very fine fish is called Tambra by the natives, from the

general prevalence of a copper colour over it. Attains the length of 21 inches and more; height 7 inches. Is excellent eating.

Cyp. Potail, Sykes.

A *Cyprinus* proper, deep and fleshy, slightly compressed, without tendrils, with the dorsal fin of 13 rays, pectoral of 14, and anal of 9. Scales large and silvery; length 10 or more inches; height $3\frac{1}{4}$ inches.

Cyp. Nukta, Sykes.

A *Cyprinus* with two tendrils on the under jaw, and with two short horns or bosses on the space between the eyes, which together with the deflected upper lip are tuberculated; large scales.

In the judgement of my friend Mr. Yarrell, to which I subscribe, this very singular fish is considered a monstrosity of *Cyp. auratus*. Dr. Ruppell, who did me the favour to look over my drawings, expresses the same opinion. Found very abundantly in the Inderanee river 18 miles north of Poona. It is called Nukta (or nob) by the Mahratta fishermen.

Varicorhinus, Ruppell.

Var. Bobree, Sykes. A *Varicorhinus* with tuberculated nose, without tendrils; with 17 rays in the dorsal, and 8 in the anal fin; with the form of a tench.

It may be a question whether this is not a real Labeo of Cuvier, with long dorsal, no spines or cirri, and thick fleshy lips frequently crenated; size 6 inches by $1\frac{6}{10}$ high.

Barbus, Cuv.

Barb. Mussullah, Sykes. A *Barbus* with 12 rays in the dorsal, 8 in the anal, and 16 in the pectoral fins, with the mouth furnished with 4 very short *cirri*, and tuberculated nose; sometimes 3 feet and more long, and a foot high, and weighing 42 pounds.

Found in the Goreh river.

Barb. Khudree, Sykes. A *Barbus* with 4 *cirri*, blood-stained fins, large hexagonal scales, elongated body, and with 14 rays in the dorsal, 14 in the pectoral, and 7 in the anal fins.

Found in the Mota Mola river, 8 miles east of Poona.

Barb. Kolus, Sykes. A *Barbus* with 13 rays in the dorsal fin, 8 in the anal, and 10 in the ventral; with moderate-sized scales; with callous tubercles on the head, and a short *cirrus* at each corner of the mouth.

This fish shows the difficulty of drawing up generic characters to embrace all the species of a genus. Having only 2 *cirri*, it should not be a Barbel; but having *cirri* at all, it does not belong to the next genus *Gobio*;—moreover, it has a spine in the dorsal.

Chondrostoma, Agassiz, the first division of the genus *Leuciscus* of Klein. Dorsal fin in the centre of the back.

Chond. Kawrus, Sykes. A *Chondrostoma*, without lateral line, tubercles, or *cirri*, with 12 rays in the dorsal, 8 in the anal, and 16 in the pectoral fins.

A sub-cylindrical fish found in the Beema river; grows to a foot in length, but is usually smaller. Proportion of length to height in one specimen, 6 inches by 1$\frac{1}{10}$ inch.

Chond. Fulungee, Sykes. A *Chondrostoma*, with dorsal fin of 10 rays, anal 6, and pectoral of 10; of an elongated, not much compressed shape. Length about a foot; height 4 inches.

Chond. Boggut, Sykes. A *Chondrostoma*, without tendrils or tubercles on the nose, with 12 rays in the dorsal, 15 in the pectoral, and 8 in the anal fin; body of an elongated form. Length from 7 to 11 inches; height 1$\frac{1}{4}$ to 2 inches.

Chond. Mullya, Sykes. A *Chondrostoma*, with a short, obtuse head, without tubercles or tendrils; sub-cylindrical body, with 11 rays in the dorsal, 14 to 16 in the pectoral, and 8 in the anal fins; a red process or protuberance on the snout between the nostrils. Length 5 to 6 inches; 1$\frac{1}{2}$ to 2 in diameter.

Chond. Wattanah, Sykes. A *Chondrostoma* of an elongated form, without tubercles or tendrils, with the dorsal fin high, and having 11 rays: and 9 or 10 in the ventral, and 8 in the anal fin; subcylindrical form. Length 4$\frac{1}{4}$ inches, height $\frac{3}{4}$ of an inch.

Found in the Beema river.

Chela, Buchanan Hamilton. A sub-genus of *Leuciscus*, with the dorsal fin very far behind over the anal; straight back, and nose on the level of the line of the back.

Chel. Balookee, Sykes. A *Chela* of the size of a minnow; back straight; body elongated; dorsal fin situated far back, and having 8 rays, 14 rays in the anal, and 12 in the pectoral fins. Length 3 inches.

Very sweet eating, the bones as well as other parts. Common in all the rivers.

Chel. Oweni, Sykes. A *Chela*, with straight back, elongated and vertically compressed body; dorsal fin situated far back, with 11 rays, 12 in the pectoral, and 19 in the anal fins, with scales so minute as to be scarcely discoverable. Length 5 inches; greatest size 7 inches.

Found in most of the rivers. The *Cyprinus Cultratus* of Bloch would appear to be the type of the sub-genus.

I have dedicated this fish to my friend Mr. Owen, the distinguished naturalist.

Chel. Jorah, Sykes. A *Chela*, with straight back, convex belly, dorsal fin far behind; size of a large minnow; with 10 rays

in the dorsal, 12 in the pectoral, and 8 rays in the anal fin. Length about 4 inches, height $\frac{8}{10}$ths of an inch.

Excellent eating. Found abundantly in the Beema river near Pairgaon.

Chel. Teekanee, Sykes. A small *Chela*, with nearly straight back; snout on the continuation of the line of the back; belly arched; with 10 rays in the dorsal, 12 in the pectoral, and 14 in the anal fins. Length $2\frac{1}{4}$ inches, height $\frac{1}{4}$ inch.

Found in the Beema.

Chel. Alkootee, Sykes. An elongated, silver-white, slightly compressed, minute *Chela*, with the dorsal fin of about 8 rays, very far back; ventral of about 7, and anal of about 10 rays, with burnished silver gill covers and black orbits; rarely more than an inch long, and not much thicker than a good-sized crow quill.

This very beautiful fish has a sweet flavour.

Leuciscus, Klein. First division. The dorsal situated a little behind the centre of the back, above the space between the ventral and anal fins.

Leuc. Morar, *Cyprinus Morar*, Buchanan Hamilton. A *Leuciscus* allied to *Chela*, but with the dorsal fin a little behind the centre of the back, with 8 rays in each ventral fin, 12 in the anal, and 10 in the dorsal, and with the edge of the belly smooth. Length $4\frac{3}{4}$ inches; height $\frac{1}{10}$.

Differs slightly from Buchanan Hamilton's *L. Morar*.

Leuc. Sandkhol, Sykes. A *Leuciscus*, with nearly cylindrical body; dorsal fin of 12 rays, pectoral of 14, and ventral of 10 rays; gibbous head; 8 to 10 inches long by $1\frac{1}{2}$ to 2 inches high; eyes with whitish narrow irides. The dorsal in this fish is situated a little *before* the centre of the back.

Found in the Goreh river at Kullumb.

Leuc. Chitul, Sykes. A *Leuciscus*, with 14 rays in the dorsal, 14 in the pectoral, and 8 in the anal fins; of a reddish grey colour, and rounded head. Sub-cylindrical. Length about 5 inches, height $1\frac{1}{4}$ inch.

Found in the Inderanee river near Chakun.

It being found impracticable to arrange, in any of the sub-genera described, the following fishes of the Carp family, it is proposed to place them in a new sub-genus, which I will call by the native Mahratta name of Rohtee.

ROHTEE, nov. genus.

Carps with a lozenge-shaped body, rather long dorsal and anal fins, the former seated on the angle of the back, with the first complete ray serrated posteriorly; scales minute.

Rohtee Ogilbii, Sykes. A *Rohtee*, with 12 rays in the dorsal, 9 in the ventral, and 17 in the anal fins; the body very compressed, and very high, with the back sloping to each

end from the centre; head sharpish; pectoral fins, narrow acuminated. First complete dorsal ray, a strong bone, serrated behind. Length, 4½ inches, height 1½ inch. A bony fish.

Found in the Beema river near Pairgaon. This fish is dedicated to my friend Mr. Ogilby, a distinguished member of the Society.

Roht. Vigorsii, Sykes. A *Rohtee*, with armed dorsal fin of 11 rays, ventral of 10, and anal of 28 rays; compressed body; high in the middle, and sloping to each end; head slightly recurved; eyes very large. Length, 6 inches; height, 1$\frac{9}{10}$ inches; greatest length, 8 inches.

Found abundantly in the Beema river at Pairgaon. I have dedicated this fish to my friend Mr. Vigors.

Roht. Pangut, Sykes. A *Rohtee*, compressed, deep, angular-backed, with 12 rays in the dorsal, 14 or 15 in the pectoral, and 8 in the anal fins, and with the first 3 or 4 rays of the dorsal fin black at their tips; scales larger than in the preceding species. Length, 5 inches; height, 1¼ inch.

Found in the Baum and Beema rivers.

Roht. Ticto; *Cyprinus Ticto* of Buchanan Hamilton. A *Rohtee*, 1½ inch long, with 4 to 6 black spots on the body; the 2nd ray of the dorsal toothed behind with sharp incurved teeth; with 10 rays in the dorsal, 8 in the anal, and 8 in the ventral fins; pectoral fins narrow, acuminate.

Found in the Mota Mola at Poona. This fish differs slightly from Dr. Buchanan Hamilton's *Cyprinus Ticto*.

Cobitis, Lin.

Cob. Rupelli, Sykes. A nearly cylindrical scaleless *Cobitis*, not much thicker than a large goose-quill; from 2 to 3 inches long, with 6 *cirri*; the lateral line marked with short brown bars, and the rays of the dorsal and anal fins similarly barred; dorsal fin of 13 rays, pectoral of 12, and ventral of 8 rays.

This fish is much esteemed for food. Found in the Beema river at Taimbournee and Mota Mola near Poona. I have dedicated this beautiful little fish to Rüppell, who did me the favour to look over my drawings, and at the same time gave me his opinion respecting the genera of the fishes.

Cob. Mooreh, Sykes. Differs from the preceding only in being of a smaller size, in having 12 rays in the dorsal, and 7 in the anal fin; the head is more obtusely pointed, and there are more dark blotches on it; the bars on the lateral line are differently arranged.

Cob. Maya, Sykes. Differs from the first species in having a spine under each eye, and in having a blunter head; 9 rays in the dorsal, 7 in the ventral fins.

Fam. *Esocidæ*.

Belone, Cuv.

Bel. Graii, Sykes. A *Belone* with the fin of the tail rounded and emarginate, with both jaws elongated into a quadrangular beak; with very minute scales; dorsal of 16 rays and anal of 16 rays: closely allied to the *Esox Cancila* of Buchanan Hamilton.

I have dedicated this fish to a gentleman well known for his contributions in natural history.

Fam. *Siluridæ*.

Schilbe, Cuv.

Sch. Pabo; *Silurus Pabo*, Buchanan Hamilton. A *Schilbe*, with the tail divided into 2 unequal lobes, both pointing downwards; with 4 *cirri*, 2 shorter than the head, and with from 68 to 70 rays in the anal fin. Length from 12 to 15 inches, height 2½ to 3 inches.

Found in most of the rivers. Differs slightly from Buchanan Hamilton's *Silurus Pabo*. No second dorsal.

Sch. Boalis, *Silurus Boalis*, Buchanan Hamilton. A *Schilbe*, with the fin of the tail divided into 2 unequal lobes; with 4 *cirri*, of which 2 extend to the middle of the fish; all the fins unarmed; dorsal of 5 rays, pectoral of 15; ventral fins very small, of 9 rays; anal fin of 84 rays. Attains the length of 3 feet, and the weight of 8 lbs.

Found in the Mota Mola at Poona. Differs slightly from the *Silurus Boalis* of Buchanan Hamilton. No second dorsal.

Hypophthalmus, Spix.

Hyp. Goongwaree, Sykes. An *Hypophthalmus*, with 8 *cirri*, all longer than the head, but not extending to the middle of the fish; with 7 rays in the dorsal, and 52 in the anal fin, with an extremely minute second dorsal; first ray in the pectoral, and first in the dorsal, spinose and serrated behind. Greatest length, 28 inches: body vertically compressed.

Found in the Mota Mola near Poona.

Hyp. Taakree, Sykes. An *Hypophthalmus*, with 8 *cirri*, 2 of which reach to the ventral fins, 2 very minute near the nostrils, and 4 on the chin, nearly as long as the head; with the first dorsal and pectoral rays serrated on the posterior edge, with 8 rays in the dorsal and 50 in the anal fin. Length, 9 inches; height, 2 inches.

Bagrus, Cuvier.

Bagr. Yarrelli, Sykes. A *Bagrus*, with the first rays of the pectoral and dorsal fins terminating in long fleshy tendrils and serrated behind; with 8 *cirri*, two of which are as long as the head, thick, fleshy, and being lateral elongations of the upper lip; other *cirri* very short; head broad, covered with a granulated bony plate; the fish olive brown, marked

with black blotches like a Dalmatian dog; 2nd dorsal fleshy, triangular. Length, 18 inches, but attains to a very great size; body not vertically compressed.

Found in the Mota Mola at Poona.

Bagr. Lonah, Sykes. A *Bagrus*, with 8 small *cirri*; flat, granulated head; first dorsal fin of 7 rays, and pectoral of 10 rays, the first ray of which is furnished on the posterior edge with long sharp teeth; anal fin of 10 rays; 2nd dorsal of a triangular form and fleshy: something resembling the preceding in colour.

Platystoma, Agassiz.

Plat. Seenghala, Sykes. A *Platystoma*, with the tail fin crescent-shaped, lobes unequal; with 8 *cirri*, two of which only are longer than the head, reaching to two-thirds of the length of the fish; the first ray of the pectoral and ventral fins serrated behind; head long, flat, spatulate, covered with a granulated bony plate. Dorsal fin of 8 rays; high, ventral fins, very far back, of 6 rays. Grows to a great size; flesh heating and soft.

Phractocephalus, Agassiz. *Pirarara* of Spix.

Phract. Kuturnee, Sykes. A *Phractocephalus*, with 6 *cirri*, 2 of which only are longer than the head; the first pectoral spine serrated on both edges; the 1st dorsal spine on the posterior edge only; these two spines terminating in a filament: the shoulder-bone elongated into a point behind. Greatest length, 6 inches; dorsal fin of 7 rays; pectoral of 9 rays; ventral fin small, of 7 rays; second dorsal replaced by a small adipose fin.

Phract. Itchkeea, Sykes. A *Phractocephalus*, with 8 *cirri*, 2 of which from the upper lip, extend to the end of the pectoral fins; the other 2 very minute, with the 4 on the chin nearly as long as the head; with the 1st ray in the pectoral fins only serrated; with 8 rays in the dorsal, and 12 in the anal fins; with a sharp prolongation of the scapula. Fish handsomely marked on the back with dark colours. Length, 2 inches.

This fish presents some slight deviations from the generic characters.

Phract. Gogra, Sykes. A *Phractocephalus*, with 4 shortish *cirri*; the plates of the shoulder elongated into acute, angular, broad spines, with a dorsal fin of 8 rays; first ray a bone serrated behind; pectoral fins of 10 rays, the first ray a broad compressed bone serrated on both edges; head flat and broad; second dorsal small, fleshy. Size 6 inches, but grows larger.

Pimelodus, La Cepede.

Pimelodus Seengtee, Sykes. A *Pimelodus*, with the caudal fin divided into 2 unequal sharpish lobes, and having 8 *cirri*, 2

of which reach to the tail fin, and 4 to the end of the head, and 2 are shorter than the head; the dorsal fin high and without spine, of 9 rays; 12 rays in the anal fin; the second dorsal adipose, and extending from the termination of the first dorsal to near the tail. Length of fish, 6 inches.

Ageneiosus, La Cepede.

Ageneiosus Childreni, Sykes. An *Ageneiosus*, without *cirri*, with the first ray of the dorsal and pectoral fins serrated on the *anterior* edge only; with 8 rays in the dorsal, and 42 in the anal fin; with two sharp lobes to the tail, the upper being somewhat the smallest. Length of fish, 18 inches; height, $4\frac{1}{2}$ inches, but grows to a larger size. Second dorsal adipose minute.

Fam. *Clupeidæ*.

Mystus, Buchanan Hamilton; *Notopterus*, La Cepede.

Mystus Badgee, Sykes. A *Mystus*, with not less than 105 rays in the anal fin, 7 or 8 in the dorsal, and in the pectoral from 13 to 16, all unarmed; without apparent ventral fins, and with a single small dorsal; the anal and caudal fins uniting, and terminating in a point at the end of the body; posterior edge of the last gill plate crenated; scales minute. This remarkable fish belongs to the genus *Mystus* of Buchanan Hamilton, but not to the genus *Mystus* of Cuvier. Fish vertically compressed. Length, 11 inches; height, 3 inches.

Ord. Apodes.

Fam. *Murænidæ*.

Anguilla, Cuv.

Ang. Elphinstonei, Sykes. An *Anguilla*, with the lower jaw the longest; with the back, tail, and anal fins united, and with a broadish, flat head; body dark green, blotched with black; with 2 short tubular processes, one on each side of the upper jaw. Attains the length of 3 feet, and diameter of 3 inches.

I have dedicated this fine fish to the Honourable Mountstewart Elphinstone.

In concluding my characters of the fishes of Dukhun (Deccan), I may be allowed to state, that I have found the number of *cirri*, whether in the *Siluridæ* or *Cyprinidæ*, insufficient as a *generic* character; different species of the same genus varying in the number of their *cirri*."

December 11, 1838.

Dr. Bostock in the Chair.

An extensive collection of Fossil Tertiary Shells, from Italy, was laid on the table, and a letter was read from Dr. Michellotti of Turin, begging the Society's acceptance of them.

A Wasp's Nest, of very large size, was also exhibited to the Members present. This nest was sent from Ceylon by the Governor of that island, and was accompanied by the following letter from Lieut. W. Williams, R.A.

Colombo, 27th May, 1838

"The specimen of the Social Wasp's nest, now on board the barque 'Morning Star,' was found by me in a talipot tree near Colombo in Ceylon: its apex was secured at the junction of two of the smallest leaves of this magnificent tree, and the bottom of the nest was about seventy feet from the ground, at which elevation the leaves began to shoot.

"It had been abandoned by the wasps, and its exterior walls were much injured by the monsoon rains and storms, which left the terraces unprotected and unsupported, except by their interior pillars: and the natives were in consequence unable to lower it from such a height without destroying some of the lower terraces.

"I shall not attempt to enter further on this subject, a structure so well known to naturalists. The appearance of the nest, as it hung upwards of seventy feet from the ground, the shaft to it perfectly bare; and the larger leaves (used by the natives as umbrellas and tents) waving over it, presented a very singular appearance: and I hope its remains may reach England in a state of preservation sufficient to satisfy the inspection of the curious.

"W. Williams, Lieut. R. Artillery."

A letter was read from Dr. Philip Poey, Corr. Memb. Z.S. dated Havanna, September 28, 1838, accompanying two specimens of *Capromys Fournieri*, which he begged to present to the Society for the Menagerie.

The reading of Mr. M'Clelland's list of new additions to the Fauna of India was resumed by Dr. Horsfield, and some drawings of the new species were exhibited.

INDEX.

The names of New Species and of Species newly characterized are printed in Roman Characters: those of Species previously known, but respecting which novel information is given, in *Italics*: those of Species respecting which Anatomical Observations are made, in CAPITALS.

	Page
Ageneiosus Childreni, *Sykes*	165
Aigocerus niger, *Harris*	2
Alauda Calandra, Linn.	113
Ambassis Barlovi, *Sykes*	158
Anguilla Elphinstonei, *Sykes*	165
Antilope Ogilbyi, *Waterh.*	60
APTERYX AUSTRALIS, Shaw	48, 71, 105
Bagrus Lonah, *Sykes*	164
Yarrelli, *Sykes*	163
Barbus Khudree, *Sykes*	159
Kolus, *Sykes*	159
Mussullah, *Sykes*	159
Bathyergus Damarensis, *Ogilby*	5
Belone Grai, *Sykes*	163
CŒLOGENYS SUBNIGER, F. Cuv.	54
CAMELOPARDALIS GIRAFFA, Gmel.	6, 20, 47
Canis jubatus, Desm.	111
megalotis	5
Cepola rubescens	45
Cercocebus	117
Cercopithecus Æthiops	117
Campbelli, *Waterh.*	61
erythrotis, *Waterh.*	59
fuliginosus	117
Martini, *Waterh.*	58
Cervus Reevesi, *Ogilby*	105
Chameleo Bibroni, *Martin*	65
cristatus, Stutchbury	63
Chela Alkootee, *Sykes*	161
Balookee, *Sykes*	160
Jorah, *Sykes*	160
Oweni, *Sykes*	160
Teckanee, *Sykes*	161
Chondrostoma Boggut, *Sykes*	160
Fulungee, *Sykes*	160
Kawrus, *Sykes*	160
Mullya, *Sykes*	160
Wattanah, *Sykes*	160
Chrysochloris Damarensis, *Ogilby*	5
Chæropus, n. g., *Ogilby*	26
CHÆROPUS, Ogilby	120 to 117
Cobitis Maya, *Sykes*	162
Mooreh, *Sykes*	162
Ruppelli, *Sykes*	162
Colobus Pennantii, *Waterh.*	57
Satanas, *Waterh.*	58
ursinus, Ogilby	61
Coluber Cantori, *Martin*	83
Chesneii, *Martin*	81
Cliffordii	81
Coronella modesta, *Martin*	82
——— multicincta, *Martin*	82
——— pulchra, *Martin*	82
Cryptobranchus Japonicus, *V. der Hoeven*	25
Cygnus immutabilis, *Yarrell*	19
Cynictis Ogilbii, Smith	5
Cyprinus Abramioides, *Sykes*	158
Morar, Buchanan Hamilton	161
Nukta, *Sykes*	159
Potail, *Sykes*	159
Ticto, Buchanan Hamilton	162
DASYURUS MACRURUS, Geoff.	120 to 147
MAUGEI, Geoff.	120 to 147
URSINUS, Geoff.	120 to 147
Delphinus FitzRoyi, *Waterh*	23
DIDELPHIS PHILANDER, Tem.	120 to 147
VIRGINIANA, Auct.	120 to 147
Echinops, n. g., *Martin*	17
Telfairi, *Martin*	17
Felis Pardina, Temm.	113
Galeopithecus	67
Galeopithecus Philippinensis, *Waterh.*	119
Temminckii, *Waterh.*	119
Genetta Poensis, *Waterh.*	59
Gerbillus Cuvieri, *Waterh.*	56
Gobius Kurpah, *Sykes*	158
Graphiurus elegans, *Ogilby*	5
Gymnotus electricus	110
HALICORE DUGONG, F. Cuv.	28
Hamadryas, n. g., *Cantor*	73
ophiophagus, *Cantor*	73

Page

Herpestes fusca, *Waterh.* 55
melanurus 5
Herpetodryas punctifer, *Martin* ... 84
Hypophthalmus Goongwarec, *Sykes.* 163
Taakree, *Sykes*..... 163
Hypsiprymnus cuniculus, *Ogilby* ... 63
formosus, *Ogilby* ... 62
melanotis, *Ogilby* ... 62
murinus, *Ogilby*..... 63
myosurus, *Ogilby* ... 62
MYOSURUS,
Ogilby.....120 to 147
Phillippi, *Ogilby*..... 62
setosus, Ogilby 62
URSINUS, Mull. 120 to 147
Isiurus Amboinensis, Cuv. 68
Lepus Bachmani, *Waterh.* 103
Leuciscus Chitul, *Sykes* 161
Morar..... 161
Sandkhol, *Sykes*..... 161
Lumoria terebrans..... 66
LIPURUS CINEREUS, *Goldf.*...120 to 147
Lipurus cinereus, Goldf. 134
Londra, n. g., *Sykes* 114
Lutra Poensis, *Waterh.* 60
MACROPUS BENNETTII,
Waterh... 120 to 147
BRUNII, Cuv. ... 120 to 147
MAJOR, Auct. ... 120 to 147
PENECILLATUS,
Gray..... 120 to 147
Macropus rufiventer, *Ogilby* 23
Macroscelides Alexandri, *Ogilby* ... 5
melanotis, *Ogilby* ... 5
Mastacembelus armatus, *Sykes* 158
Meles Labradoria 153
MYOCOPAMUS COYPUS 118
Mystus Badgee, *Sykes*..... 165
MYRMECOBIUS FASCIATUS,
Waterh... 120 to 147
Myrmecobius fasciatus, Waterh. ... 119
Ophicephalus leucopunctatus, *Sykes* 158
Otolicnus Garnettii, *Ogilby* 6
Ovis Nahor, Hodgson..... 79
Pelamys bicolor 4
Perameles ecaudatus, *Ogilby* 25
GRISEA ..... 120 to 147
Gunnii, *Gray*..... 1
LAGOTIS, Reid ... 120 to 147
lagotis, Reid 119
NASUTA, Geoff.... 120 to 147
Petaurus breviceps, *Waterh.*..... 152
flaviventer, ... 149
MACRURUS, Desm. 120 to 147
PYGMÆUS, Desm... 120 to 147
SCIUREUS, Geoff.... 120 to 147
sciureus. 149
TAGUANOIDES, Desm. 120 to 147

Page

Petaurus Taguanoïdes..... 149
PHALANGISTA COOKII, Desm. 120 to 147
GLIRIFORMIS,
Bell ..... 120 to 147
URSINA, Tem. 120 to 147
VULPINA,
Desm. ... 120 to 147
PHASCOLOMYS WOMBAT,
Peron et Lesu... 120 to 147
PHASCOLOTHERIUM, Owen... 120 to 147
Phractocephalus Gogra, *Sykes* 164
Itchkeea, *Sykes* ... 164
Kuturnee, *Sykes* ... 164
Pimelodus Scengtee, *Sykes*..... 164
Platystoma Scenghala, *Sykes*..... 174
Ptilotis flavigula, *Gould* 21
ornata, *Gould*..... 24
Rohtee, n. g., *Sykes*..... 161
Ogilbii, *Sykes*..... 161
Pangut, *Sykes*..... 162
Tiela 162
Vigorsii, *Sykes* 162
Schilbe Boalis 163
Pabo 163
Sciurus Audubon, *Bachm.* 97
aureogaster, F. Cuv. et Geoff. 88
capistratus, Bosc. 85
Carolinensis, Gmel. 94
cinereus, Gmel. 89
Collæi, Richardson 95
Douglasii, Gray 99
fuliginosus, *Bachm.* 97
Hudsonius, Pennant 100
lanuginosus, *Bachm.* 101
leucotis, Gapper..... 91
macrourus, Say 88
magnicaudatus, Harlan 88
niger, Linn. 96
niger, Catesby 85
nigrescens, Bennett 96
Richardson, *Bachm.* 100
rufiventer 98
subauratus, *Bachm.* 87
sublineatus, *Waterh.*..... 19
Texianus, *Bachm* 86
variegatus, Desm. 85
vulpinus, Gmel. 85
Silurus Boalis, Buchanan Hamilton 163
Pabo, Buchanan Hamilton... 163
Tarsius Spectrum, Geoff..... 67
THYLACINUS HARRISII, Tem. 120 to 147
THYLACOLEO RUM, Owen ... 120 to 147
Triton cristatus 23
marmoratus..... 23
Varicorhinus Bobree, *Sykes* 159
Varianus Cuningi, *Martin*..... 69
Vipera Euphratica, *Martin*..... 82

Printed by Richard and J. E. Taylor, Red Lion Court, Fleet Street